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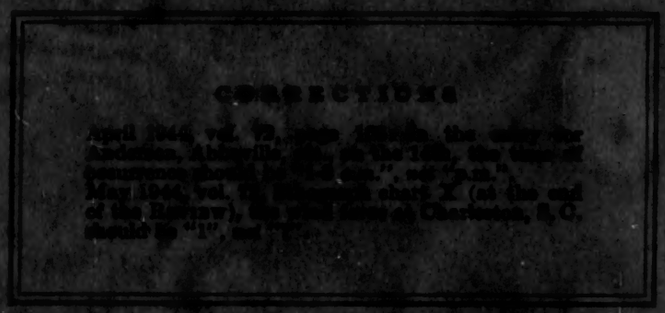

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NOMOGRAPHS FOR THE SOLUTION OF PSYCHROMETRIC PROBLEMS [1]

By E. BERL and G. A. STERBUTZEL

[Carnegie Institute of Technology, Pittsburgh, Pa., May 1944]

THE nomographs presented in figures 1 and 2 facilitate psychrometric calculations on the basis of given dry-bulb and wet-bulb temperatures obtained at specified barometric pressures. In addition to dewpoint and relative humidity data, the heat content and the mixing ratio may be obtained within the limits shown upon the charts. Figure 1 is used with metric, and figure 2, with English units.

Near the foot of the diagrams are scales for determining (1) the heat content or enthalpy [2], (2) the vapor pressure, and (3) the mixing ratio. Heat content, which is a function of the wet-bulb temperature, is expressed in terms of the unit: kilocalories per kilogram of dry air above 0°C. in the metric system, and B.t.u. per pound of dry air above 0°F. in the English system. The vapor pressure, determined from the dewpoint, is given in millimeters of mercury or inches of mercury. Units of mixing ratio are grams of water vapor per kilogram of dry air and grains of water vapor per pound of dry air.

A transverse line divides the relative humidity scale into two parts. The upper (high humidity) portion bears the legend, "Use with scale I," while the lower (low humidity) portion carries the legend, "Use with scale II." These legends refer to the two dewpoint scales, designated "I" and "II," respectively, barometric pressure assumed to be 760 millimeters or 29.92 inches of mercury.

In the use of the nomographs, the dewpoint scale to be used is determined from the legend applying to that section of the humidity scale on which the relative humidity is found. (See par. 2, below.)

USE OF NOMOGRAPH

1. Connect the dry-bulb temperature and the wet-bulb temperature by a straight edge.

2. Obtain the relative humidity from the scale captioned "Relative humidity," at the point of intersection of the straightedge with the curve corresponding to the barometric pressure; at the same time, note which of the two legends, "Use with scale I" or "Use with scale II," applies to the point just determined.

3. Obtain the dewpoint from the dewpoint scale headed with the roman numeral I or II, specified in the legend noted. Read the dewpoint value at the intersection of the straightedge with the curve pertaining to the appropriate pressure.

Data for the construction of the nomographs were taken from "Psychrometric Charts for High and Low Pressures", by Donald B. Brooks, U. S. Department of Commerce Bulletin M–146, and from "Chemische Ingenieur Technik," vol. 2, pages 618–634, by E. Berl.

[1] This work was made possible by a grant to Carnegie Institute of Technology from the Buhl Foundation, for which the authors express their appreciation.

[2] See also Kiefer, Paul J. "The Thermodynamic Properties of Water and Water Vapor," MO. WEA. REV., Nov. 1941, vol. 69, pp. 329–331.

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NOMOGRAPH FOR THE DETERMINATION OF PSYCHROMETRIC DATA

by E. Berl and G. A. Sterbutzel

Carnegie Institute of Technology, Pittsburgh, Pa.

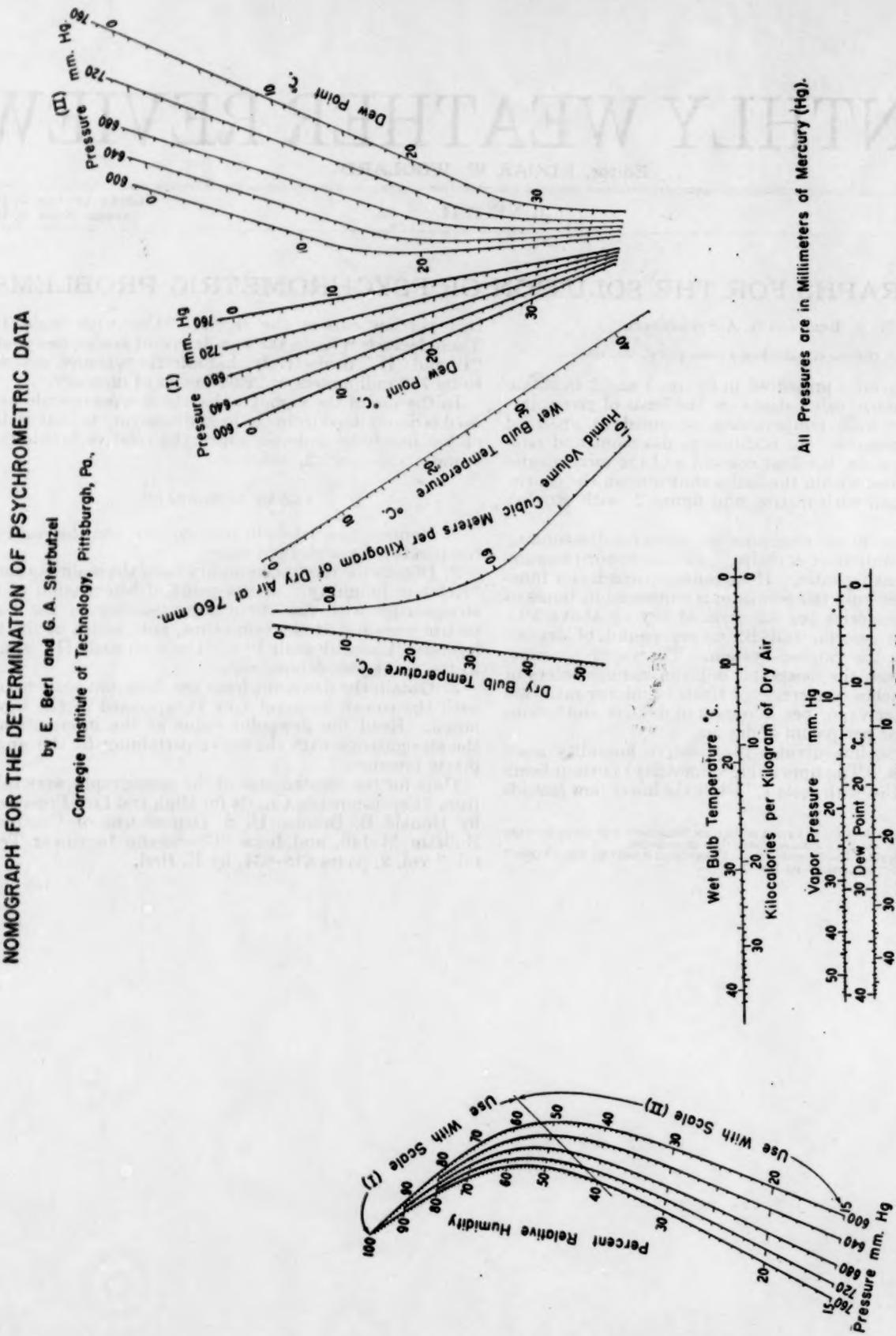

Fig. 1

NOMOGRAPH FOR THE DETERMINATION OF PSYCHROMETRIC DATA

by E. Berl and G. A. Sterbutzel
Carnegie Institute of Technology, Pittsburgh, Pa.

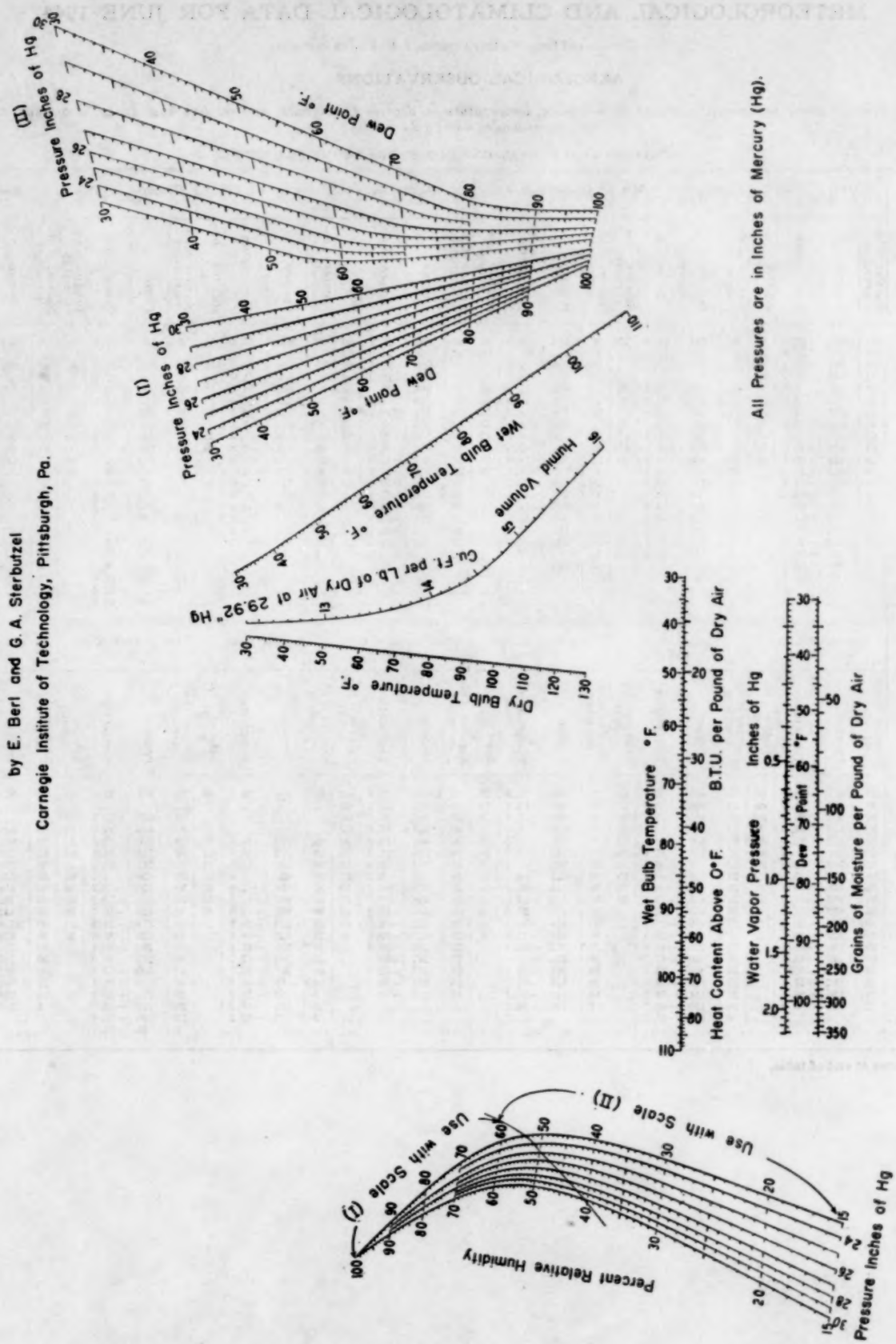
(II)
Pressure Inches of Hg
Dew Point °F.
(I)
Pressure Inches of Hg
Dew Point °F.
Wet Bulb Temperature °F.
Humid Volume
Cu. Ft. per Lb. of Dry Air at 29.92" Hg
Dry Bulb Temperature °F.
All Pressures are in Inches of Mercury (Hg).
Wet Bulb Temperature °F.
Heat Content Above 0°F. B.T.U. per Pound of Dry Air
Water Vapor Pressure Inches of Hg
Dew Point °F
Grains of Moisture per Pound of Dry Air
Use with Scale (II)
Use with Scale (I)
Percent Relative Humidity
Pressure Inches of Hg

Fig. 2

METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR JUNE 1944

[Climate and Crop Weather Division, J. B. KINCER in charge]

AEROLOGICAL OBSERVATIONS

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by radiosondes during June 1944*

STATIONS AND ELEVATIONS IN METERS ABOVE SEA LEVEL

Altitude (meters) m. s. l.	Albany, N. Y. (86 m.)				Albuquerque, N.Mex. (1,620 m.)				Apalachicola, Fla. (5 m.)				Atlanta, Ga. (300 m.)				Big Spring, Tex. (774 m.)				Bismarck, N. Dak. (505 m.)				Boise, Idaho (868 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	1,002	17.0	82	28	834	24.3	25	30	1,014	26.5	82	30	981	24.9	69	30	923	27.1	51	30	951	17.4	80	30	911	18.1	56
500	30	955	16.8	71	----	----	----	----	30	959	24.9	69	30	959	24.9	61	----	----	----	----	----	----	----	----	----	----	----	----
1,000	30	901	14.5	71	----	----	----	----	30	906	22.0	62	30	906	22.3	58	30	900	25.7	51	30	897	15.6	68	30	897	17.7	50
1,500	30	849	11.7	73	----	----	----	----	30	855	18.5	62	30	855	19.0	58	30	850	21.9	54	30	846	12.2	71	30	846	14.2	46
2,000	30	799	9.0	70	28	798	22.4	24	30	806	15.3	60	30	806	15.5	62	30	802	18.7	51	30	796	9.0	72	30	796	10.2	51
2,500	30	752	6.4	65	28	753	18.8	24	30	760	12.0	55	30	760	12.0	60	30	756	16.0	39	30	750	5.9	67	30	750	6.3	56
3,000	30	707	3.8	61	28	710	14.8	27	30	716	8.9	52	30	716	8.7	58	30	713	12.5	41	30	705	3.2	54	30	705	2.7	59
4,000	30	625	−1.8	52	28	630	6.1	36	30	634	3.5	43	30	633	2.5	49	30	632	5.3	40	29	623	−2.7	48	30	622	−4.8	64
5,000	30	550	−6.8	41	28	556	−2.3	47	30	560	−2.2	41	30	559	−2.5	43	30	558	−1.4	35	29	549	−8.9	40	30	547	−11.6	59
6,000	30	484	−13.0	32	28	490	−10.0	51	30	493	−7.8	35	30	492	−8.4	38	30	492	−7.8	29	29	481	−15.5	36	30	480	−18.7	58
7,000	29	423	−20.1	37	28	430	−16.2	40	29	432	−14.4	39	30	432	−15.2	38	30	432	−15.0	----	28	421	−22.0	39	30	419	−25.8	41
8,000	29	369	−27.1	----	26	375	−23.1	----	28	378	−21.4	36	29	378	−22.1	46	30	377	−22.3	----	27	366	−29.3	38	30	363	−33.2	----
9,000	29	320	−34.8	----	26	326	−30.4	----	28	329	−28.7	----	28	329	−29.5	43	30	328	−29.6	----	27	317	−36.8	----	29	314	−40.9	----
10,000	29	277	−42.2	----	26	283	−37.8	----	28	286	−36.5	----	26	286	−37.1	----	30	285	−37.3	----	27	274	−43.9	----	27	271	−47.0	----
11,000	29	238	−49.2	----	25	244	−44.5	----	28	247	−44.3	----	24	246	−44.6	----	30	246	−44.9	----	27	236	−49.7	----	23	233	−49.7	----
12,000	29	204	−54.7	----	25	210	−50.5	----	28	212	−51.7	----	21	212	−51.8	----	29	211	−52.1	----	26	203	−53.2	----	21	200	−50.2	----
13,000	27	175	−57.7	----	20	181	−55.6	----	28	182	−58.6	----	20	182	−58.1	----	28	181	−58.9	----	24	173	−54.3	----	18	171	−51.3	----
14,000	22	149	−59.0	----	13	154	−60.1	----	24	155	−63.8	----	13	154	−61.9	----	23	154	−65.5	----	23	148	−56.1	----	14	146	−52.4	----
15,000	15	127	−59.2	----	8	132	−64.6	----	14	132	−67.5	----	----	----	----	----	9	130	−69.7	----	18	127	−57.7	----	13	126	−54.0	----
16,000	9	108	−59.5	----	----	----	----	----	5	113	−69.7	----	----	----	----	----	----	----	----	----	14	109	−59.4	----	8	108	−56.0	----
17,000	5	93	−59.7	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	13	93	−60.0	----	5	92	−55.6	----
18,000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	8	79	−59.1	----	----	----	----	----
19,000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	68	−58.2	----	----	----	----	----

Altitude (meters) m. s. l.	Brownsville, Tex. (6 m.)				Buffalo, N. Y. (221 m.)				Caribou, Maine (193 m.)				Charleston, S. C.[1] (14 m.)				Denver, Colo. (1616 m.)				Dodge City, Kans. (787 m.)				El Paso, Tex. (1195 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	1,011	26.6	86	30	987	17.2	85	30	969	13.3	78	30	1,013	23.4	92	30	834	19.2	48	30	921	22.5	69	30	877	27.2	29
500	30	956	23.0	85	30	956	18.2	71	30	953	13.4	69	30	959	23.2	69	----	----	----	----	----	----	----	----	----	----	----	----
1,000	30	903	20.7	70	30	901	15.8	66	30	898	11.4	70	30	905	20.5	64	----	----	----	----	30	899	22.5	62	----	----	----	----
1,500	30	852	18.8	57	30	850	12.8	67	30	846	8.6	72	30	854	17.6	62	----	----	----	----	30	848	19.9	59	30	848	26.2	26
2,000	30	803	16.4	48	30	800	10.0	60	30	796	5.5	73	30	805	14.5	59	30	798	19.0	41	30	800	17.3	55	30	801	22.7	26
2,500	30	757	13.8	42	30	753	7.1	56	30	749	2.7	66	30	759	11.3	58	30	752	15.4	42	30	754	14.1	49	30	755	18.7	29
3,000	30	713	10.9	39	30	708	4.4	51	30	703	.4	61	30	714	8.4	55	30	709	11.3	44	30	711	11.0	43	30	713	14.5	33
4,000	30	632	5.1	32	29	626	−.7	38	30	621	−4.9	48	29	633	2.7	53	30	628	3.4	51	30	630	3.5	40	30	632	6.1	40
5,000	30	558	−1.1	32	28	552	−6.0	29	30	546	−10.5	48	29	558	−3.1	50	30	554	−4.8	57	30	556	−3.7	38	30	559	−1.2	41
6,000	30	492	−7.0	28	28	485	−12.2	29	30	479	−17.0	47	29	491	−8.7	47	30	487	−12.4	53	30	489	−10.2	30	30	492	−7.8	38
7,000	30	432	−13.6	----	28	425	−19.1	----	30	418	−24.0	48	29	431	−15.2	45	29	427	−19.6	46	30	429	−16.7	28	30	432	−14.5	----
8,000	30	378	−20.7	----	28	370	−26.1	----	30	364	−30.7	40	28	377	−21.9	45	28	372	−26.8	----	30	374	−24.2	35	30	378	−21.5	----
9,000	30	329	−28.0	----	27	322	−33.4	----	30	315	−37.8	31	28	328	−29.1	46	28	323	−34.4	----	30	325	−31.6	38	30	329	−28.6	----
10,000	29	286	−35.6	----	27	279	−40.6	----	30	272	−44.4	----	27	286	−36.3	----	27	279	−41.4	----	30	282	−39.1	----	30	286	−36.3	----
11,000	29	247	−43.0	----	26	240	−47.7	----	29	234	−50.6	----	27	247	−44.1	----	23	241	−47.7	----	30	243	−46.6	----	30	247	−44.1	----
12,000	20	212	−50.7	----	26	206	−53.3	----	24	201	−53.0	----	24	212	−52.2	----	16	207	−52.7	----	30	209	−53.4	----	30	212	−51.1	----
13,000	28	182	−57.7	----	25	176	−57.3	----	20	173	−53.9	----	16	181	−59.2	----	14	178	−56.5	----	30	178	−58.4	----	27	182	−57.8	----
14,000	28	155	−64.3	----	20	151	−58.5	----	13	148	−56.2	----	13	155	−64.1	----	9	152	−58.2	----	29	152	−62.1	----	18	155	−62.6	----
15,000	12	131	−69.9	----	10	130	−60.7	----	7	126	−56.2	----	----	----	----	----	5	129	−58.5	----	20	129	−65.0	----	8	131	−67.3	----
16,000	----	----	----	----	6	111	−61.7	----	----	----	----	----	----	----	----	----	5	110	−62.2	----	12	109	−65.4	----	----	----	----	----
17,000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	6	93	−64.7	----	----	----	----	----

See footnotes at end of table.

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by radiosondes during June 1944*—Continued

STATIONS AND ELEVATIONS IN METERS ABOVE SEA LEVEL—Continued

Altitude (meters) m. s. l.	Ely, Nevada[1] (1908 m.)				Glasgow, Montana (648 m.)				Great Falls, Mont. (1128 m.)				Greensboro, N. C. (273 m.)				Hatteras, N. C. (3 m.)				Huntington, W. Va. (172 m.)				Int'l Falls, Minn. (343 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	29	806	14.0	44	30	936	16.6	74	30	884	14.6	65	28	984	22.4	74	30	1,014	23.9	85	30	995	20.8	85	30	971	15.7	78
500													28	958	22.8	63	30	958	21.6	75	30	957	22.3	70	30	953	16.2	72
1,000					30	898	14.9	65					28	905	19.8	61	30	904	18.9	68	30	905	19.7	65	30	898	13.2	72
1,500					30	846	11.3	69	30	847	12.4	59	28	854	16.1	66	30	853	15.7	65	30	853	16.3	63	30	846	10.7	73
2,000	29	797	14.4	43	30	797	7.7	74	30	797	8.9	64	28	805	12.9	66	30	804	12.7	59	30	804	13.1	63	30	796	7.8	70
2,500	29	750	11.6	41	30	750	4.5	76	30	750	5.2	68	28	758	9.8	59	30	757	9.8	54	30	757	10.3	56	30	749	5.1	65
3,000	29	707	7.7	42	30	705	1.8	67	30	705	1.8	71	28	714	6.9	45	30	712	7.1	49	30	713	7.1	50	30	705	2.3	57
4,000	29	625	−.5	47	30	622	−3.9	59	29	622	−4.7	71	27	631	1.9	41	30	630	1.3	43	29	631	.9	43	30	622	−2.9	53
5,000	29	551	−8.9	49	30	547	−10.1	55	29	547	−11.0	64	27	557	−4.6	37	30	555	−4.3	39	29	557	−4.9	36	30	548	−8.8	49
6,000	28	483	−16.1	48	30	480	−16.5	53	29	479	−17.6	54	27	490	−10.5	29	30	489	−10.3	37	29	489	−10.7	30	30	481	−14.9	43
7,000	27	422	−23.4	43	30	419	−23.5	50	29	419	−24.7	53	27	429	−17.4	31	30	429	−16.9	39	29	429	−17.3	36	29	420	−22.0	39
8,000	26	368	−30.7	40	30	364	−30.9	47	27	364	−32.5	50	26	375	−24.6	----	28	374	−24.3	----	29	375	−24.6	38	29	366	−29.2	42
9,000	24	319	−38.1	42	30	316	−38.8	----	27	315	−40.7	----	26	326	−32.0	----	28	325	−31.7	----	29	325	−32.0	----	29	317	−36.8	----
10,000	23	275	−45.6	----	30	272	−46.6	----	27	272	−48.7	----	26	282	−39.7	----	28	282	−39.5	----	29	282	−39.4	----	28	274	−44.0	----
11,000	21	236	−51.4	----	29	234	−52.7	----	26	233	−53.4	----	26	244	−47.2	----	27	243	−46.8	----	28	243	−47.1	----	27	236	−50.1	----
12,000	19	202	−54.8	----	23	201	−54.3	----	23	200	−53.5	----	25	209	−54.3	----	18	209	−54.3	----	27	209	−53.7	----	22	202	−53.5	----
13,000	15	172	−58.6	----	17	171	−52.7	----	20	171	−53.3	----	24	178	−60.1	----	11	179	−59.9	----	25	178	−59.5	----	15	172	−53.3	----
14,000	12	147	−61.9	----	11	147	−53.2	----	6	147	−53.8	----	21	152	−64.0	----					21	152	−62.8	----	14	147	−54.6	----
15,000	8	125	−66.5	----	5	126	−54.5	----					13	129	−65.2	----					9	129	−63.7	----	10	126	−55.4	----
16,000	6	105	−68.9	----									7	110	−65.8	----									8	107	−56.5	----
17,000													6	93	−66.4	----												

Altitude (meters) m. s. l.	Jackson, Miss. (97 m.)				Joliet, Ill. (178 m.)				Lake Charles, La. (5 m.)				Lakehurst, N. J.[1] (39 m.)				Little Rock, Ark. (79 m.)				Louisville, Ky. (166 m.)				Mazatlan, Mexico (80 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	1,003	25.6	80	30	992	20.5	81	30	1,014	26.4	84	29	1,011	19.4	77	29	1,005	26.1	75	30	995	23.9	68	30	1,002	25.6	80
500	30	958	25.5	65	30	956	22.0	67	30	958	23.8	74	29	958	18.9	67	29	958	24.9	62	30	958	24.2	59	30	955	22.9	74
1,000	30	905	22.2	65	30	903	19.1	65	30	905	20.9	68	29	904	16.3	63	29	904	21.4	64	30	905	20.8	61	30	902	22.7	65
1,500	30	855	18.8	64	30	852	15.7	66	30	854	18.1	62	29	853	13.6	66	29	854	17.9	60	30	854	17.0	64	30	852	20.5	61
2,000	30	806	15.6	60	30	803	13.0	60	30	805	15.3	56	28	803	11.4	61	29	805	15.4	50	30	805	14.3	55	30	803	18.6	53
2,500	30	760	12.4	55	30	756	10.4	51	30	759	13.0	45	28	756	8.7	59	29	759	12.5	42	30	758	11.5	46	30	758	16.9	44
3,000	30	715	9.2	51	30	712	7.8	43	30	715	10.2	39	27	711	5.9	58	29	715	9.5	39	30	714	8.5	43	30	715	14.3	42
4,000	30	633	3.3	46	30	630	1.6	39	30	634	4.6	35	27	629	.2	49	28	633	3.2	37	30	632	1.8	43	28	634	7.4	53
5,000	30	560	−1.9	40	30	556	−4.5	38	30	560	−1.3	35	27	554	−5.4	38	28	559	−3.0	31	30	558	−3.5	33	26	561	.1	59
6,000	30	492	−7.9	35	30	489	−10.5	33	30	493	−7.4	36	26	488	−10.9	----	28	492	−8.8	----	30	491	−9.4	27	23	495	−6.6	47
7,000	29	432	−14.6	44	30	428	−17.1	----	30	433	−14.2	33	26	428	−17.8	----	28	431	−15.8	----	30	431	−16.3	31	23	435	−13.0	46
8,000	29	378	−21.8	45	30	374	−24.0	----	30	378	−21.4	34	23	374	−25.2	----	28	377	−23.1	----	30	376	−23.7	34	22	380	−19.5	----
9,000	29	329	−29.3	50	30	325	−31.1	----	30	329	−28.8	36	23	324	−31.8	----	28	328	−30.6	----	30	327	−31.0	----	21	331	−26.2	----
10,000	29	286	−37.0	----	30	282	−38.4	----	30	286	−36.2	----	22	282	−40.0	----	26	284	−38.1	----	29	284	−38.4	----	21	288	−33.8	----
11,000	28	246	−44.9	----	29	244	−45.6	----	30	247	−43.8	----	21	243	−46.9	----	25	245	−46.1	----	29	245	−46.1	----	20	250	−41.2	----
12,000	28	212	−52.8	----	29	209	−51.9	----	30	212	−51.1	----	16	208	−52.5	----	25	211	−53.3	----	29	210	−53.2	----	20	215	−48.7	----
13,000	27	181	−59.3	----	22	179	−56.6	----	30	182	−57.5	----	7	178	−56.5	----	25	180	−59.5	----	28	180	−59.3	----	20	184	−56.3	----
14,000	22	154	−64.3	----	18	153	−60.6	----	28	155	−62.7	----					21	154	−64.4	----	23	153	−63.5	----	18	158	−62.4	----
15,000	15	131	−68.2	----	14	130	−63.8	----	23	132	−67.1	----					12	130	−67.0	----	12	130	−65.8	----	12	134	−68.3	----
16,000	7	111	−70.8	----	9	111	−63.6	----	14	112	−70.0	----					7	110	−67.3	----	8	111	−68.7	----	5	113	−72.6	----
17,000					5	94	−63.0	----																				

Altitude (meters) m. s. l.	Medford, Oreg.[2] (409 m.)				Miami, Fla.[3] (4 m.)				Nashville, Tenn. (180 m.)				Norfolk, Va.[1] (4 m.)				Oakland, Calif. (2 m.)				Ogden, Utah (1,355 m.)				Oklahoma City, Okla. (391 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	966	19.7	49	30	1,015	26.0	81	30	994	26.1	62	27	1,014	24.4	75	30	1,013	15.2	73	30	860	17.5	52	30	966	24.8	74
500	30	956	19.0	50	30	960	24.0	84	30	959	25.4	54	27	958	21.7	67	30	955	13.4	72					30	954	24.9	70
1,000	30	901	15.1	54	30	907	21.2	76	30	906	21.8	57	27	904	18.5	67	30	900	14.1	55					30	902	22.8	64
1,500	30	849	11.1	61	30	856	18.3	71	30	855	18.1	59	27	853	15.4	67	30	848	12.6	44	30	846	17.3	43	30	852	19.6	65
2,000	30	800	7.4	66	30	807	15.2	69	30	806	15.1	55	27	804	12.6	64	30	798	10.1	37	30	797	13.9	41	30	803	17.2	54
2,500	30	752	4.7	65	30	760	12.3	65	30	759	12.2	51	27	757	9.7	57	30	752	7.2	32	30	750	10.1	45	29	757	14.9	40
3,000	30	707	1.9	64	30	716	9.5	60	30	715	9.0	46	27	713	6.8	48	30	707	4.2	32	30	706	6.1	49	29	714	11.8	37
4,000	30	624	−3.6	62	30	634	3.8	56	30	633	2.6	42	27	630	.9	42	30	625	−1.9	28	30	624	−2.0	55	29	633	5.2	31
5,000	30	549	−9.6	55	29	560	−1.5	54	30	559	−3.2	35	27	556	−4.8	39	30	550	−8.3	31	30	550	−9.4	56	29	559	−1.5	28
6,000	30	482	−16.2	50	29	494	−7.2	49	30	492	−9.0	27	27	489	−10.9	38	30	482	−15.1	27	30	482	−16.5	61	29	492	−7.9	----
7,000	30	421	−23.5	49	28	434	−13.5	49	30	432	−15.4	----	27	428	−17.6	38	30	422	−22.3	----	30	421	−23.6	51	29	432	−14.8	----
8,000	28	366	−31.3	45	28	379	−20.3	49	30	377	−22.6	----	27	374	−24.8	----	30	367	−29.8	----	30	366	−31.2	50	28	378	−22.2	----
9,000	27	318	−38.7	42	28	330	−27.4	50	30	328	−30.0	----	27	325	−32.2	----	30	318	−36.8	----	29	317	−39.0	----	28	328	−29.7	----
10,000	26	274	−45.4	----	28	288	−35.0	36	30	285	−37.6	----	21	282	−39.6	----	29	275	−42.8	----	28	274	−46.7	----	28	285	−37.4	----
11,000	24	236	−49.2	----	27	248	−42.6	----	29	246	−45.3	----	20	243	−47.3	----	28	237	−48.2	----	27	235	−50.8	----	28	246	−45.1	----
12,000	22	203	−52.4	----	27	214	−50.5	----	29	211	−52.3	----	19	208	−54.0	----	25	204	−51.0	----	27	201	−52.4	----	28	211	−52.4	----
13,000	17	173	−54.4	----	26	183	−58.1	----	26	180	−58.8	----	17	178	−59.0	----	24	174	−53.5	----	26	172	−54.0	----	28	181	−58.5	----
14,000	12	149	−54.9	----	20	157	−63.5	----	18	154	−62.8	----	11	152	−62.1	----	21	149	−55.8	----	20	147	−56.2	----	26	154	−63.5	----
15,000	6	127	−55.0	----	14	133	−67.9	----	5	130	−64.0	----	7	129	−64.4	----	19	128	−58.4	----	11	126	−57.8	----	18	131	−66.6	----
16,000																	16	109	−58.9	----					9	111	−68.7	----
17,000																	11	92	−59.4	----								
18,000																	6	79	−59.2	----								

See footnotes at end of table.

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by radiosondes during June 1944*—Continued

STATIONS AND ELEVATIONS IN METERS ABOVE SEA LEVEL—Continued

Altitude (meters) m. s. l.	Omaha, Nebr. (301 m.)				Phoenix, Ariz. (339 m.)				Pittsburgh, Pa. (392 m.)				Portland, Maine [2] (20 m.)				Rapid City, S. Dak. (981 m.)				St. Louis, Mo. (171 m.)				St. Paul, Minn. (225 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	29	976	23.0	74	30	967	28.6	24	30	969	20.4	71	30	1,010	14.3	89	30	900	16.0	76	30	994	24.8	66	30	984	20.2	75
500	29	954	22.6	69	30	949	30.5	16	30	957	20.7	68	30	954	15.3	77					30	957	23.9	59	30	953	19.4	68
1,000	29	900	19.6	68	30	897	27.0	17	30	903	18.6	63	30	900	13.8	74	30	898	16.0	75	30	904	20.8	59	30	899	16.6	69
1,500	29	849	16.6	68	30	848	22.8	20	30	853	15.4	65	30	848	10.8	75	30	847	14.4	63	30	854	17.9	56	30	848	13.9	68
2,000	29	800	14.7	59	30	800	18.5	24	30	803	12.1	67	30	798	8.0	76	30	798	11.3	64	30	804	15.2	46	30	798	11.4	60
2,500	29	754	11.9	55	30	754	14.2	28	30	756	9.3	58	30	751	5.4	71	30	751	8.3	64	30	758	12.9	42	30	752	8.8	54
3,000	29	711	9.0	48	30	710	10.2	29	30	712	6.6	47	30	706	2.6	68	30	707	5.4	59	30	714	9.9	40	30	708	5.9	52
4,000	29	629	2.5	44	30	629	3.6	25	30	630	1.2	41	30	624	−2.0	57	30	624	−.9	54	30	632	2.9	44	28	625	−.4	46
5,000	29	555	−4.3	41	30	556	−2.5	....	30	556	−3.9	31	30	550	−7.7	51	30	550	−7.5	49	30	558	−3.2	36	28	552	−6.0	29
6,000	29	488	−11.0	40	30	489	−9.0	....	30	488	−10.2	31	29	482	−13.8	47	30	483	−14.3	49	30	491	−9.0	33	28	485	−12.3	30
7,000	28	428	−18.0	....	30	429	−16.1	....	30	429	−16.9	....	29	422	−20.7	44	29	423	−21.3	49	30	431	−15.9	33	28	425	−19.5	....
8,000	28	373	−24.7	....	30	375	−23.7	....	30	374	−23.9	....	28	367	−28.0	47	29	368	−28.5	44	30	376	−23.0	....	27	370	−27.2	....
9,000	28	324	−32.1	....	30	326	−31.5	....	30	325	−31.5	....	26	318	−35.2	58	29	319	−35.8	....	30	327	−30.6	....	27	321	−34.6	....
10,000	28	282	−39.5	....	30	283	−39.0	....	30	282	−39.2	....	25	276	−42.0	....	29	276	−43.0	....	30	284	−38.2	....	27	278	−41.6	....
11,000	28	243	−46.1	....	30	244	−46.1	....	30	243	−46.5	....	23	238	−49.0	....	27	238	−49.4	....	29	245	−45.7	....	27	239	−48.0	....
12,000	27	209	−51.5	....	30	209	−52.7	....	30	208	−53.1	....	21	204	−54.1	....	15	205	−53.3	....	29	211	−53.1	....	27	205	−53.1	....
13,000	26	179	−56.4	....	29	179	−57.5	....	28	179	−58.4	....	21	174	−56.5	....	12	176	−55.5	....	29	180	−59.2	....	26	176	−56.2	....
14,000	22	152	−59.4	....	25	153	−61.9	....	26	152	−60.9	....	18	149	−58.1	....	8	151	−58.6	....	24	153	−62.7	....	22	149	−57.0	....
15,000	16	130	−62.1	....	9	130	−63.9	....	13	130	−62.0	....	15	126	−58.6	....	7	128	−60.1	....	18	130	−64.9	....	21	127	−58.8	....
16,000	13	111	−63.9	....									13	108	−59.6	....	7	110	−61.1	....	12	111	−66.4	....	16	109	−60.5	....
17,000	6	94	−61.9	....									8	93	−60.3	....									12	93	−60.7	....
18,000																									8	79	−58.7	....
19,000																									6	67	−57.4	....

Altitude (meters) m. s. l.	San Antonio, Tex. (242 m.)				San Diego, Calif.[1] (19 m.)				San Juan, P. R. (15 m.)				Santa Maria, Calif. (71 m.)				S. S. Marie, Mich.[2] (221 m.)				Seattle, Wash.[1] (22 m.)				Spokane, Wash. (598 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	984	26.5	72	27	1,011	16.7	78	30	1,014	25.8	87	30	1,006	13.9	83	30	987	13.0	83	29	1,012	18.3	57	30	941	19.9	49
500	30	956	25.0	72	27	955	13.7	81	30	960	22.4	86	30	956	12.8	80	30	955	14.6	76	29	956	14.3	63				
1,000	30	903	21.6	73	27	900	13.5	57	30	906	19.2	82	30	901	13.7	59	30	900	13.8	67	29	901	10.5	68	30	898	16.4	47
1,500	30	852	18.6	73	27	849	13.8	36	30	855	16.5	75	30	849	13.2	43	30	849	11.9	69	29	849	7.2	68	30	846	12.2	52
2,000	30	804	16.3	56	27	799	12.9	22	30	806	14.2	65	30	799	10.6	39	30	799	9.1	69	29	798	4.4	66	30	797	8.2	58
2,500	30	758	14.4	40	27	753	11.3	....	30	759	11.7	58	30	752	7.7	34	30	752	6.5	66	29	750	1.7	65	30	750	4.2	64
3,000	30	714	11.8	33	27	709	9.1	....	30	715	8.8	50	30	708	4.8	27	30	707	4.1	62	29	705	−1.2	57	30	705	.5	67
4,000	30	633	5.9	28	27	628	4.7	....	30	633	2.8	48	30	625	−0.6	23	30	625	−.9	55	29	621	−6.3	41	30	621	−6.0	62
5,000	30	560	−.5	28	27	554	−2.3	....	29	559	−2.9	48	30	551	−6.6	20	30	551	−6.4	49	28	546	−12.1	34	30	546	−12.1	48
6,000	30	493	−6.8	....	27	488	−9.1	....	28	492	−9.0	47	30	484	−13.2	....	29	484	−13.4	45	28	479	−19.5	38	30	479	−18.7	47
7,000	30	433	−13.6	....	26	428	−16.5	....	28	432	−15.4	49	30	424	−20.6	....	29	424	−20.2	43	28	418	−26.9	40	29	417	−26.2	49
8,000	30	379	−20.7	....	24	374	−24.4	....	28	378	−21.8	47	30	370	−27.9	....	26	369	−27.7	39	27	362	−34.6	....	29	362	−33.7	45
9,000	29	330	−27.9	....	24	325	−31.7	....	27	328	−29.1	47	29	320	−35.2	....	26	320	−34.8	38	27	313	−41.9	....	29	313	−41.6	....
10,000	29	286	−35.4	....	23	282	−39.1	....	27	285	−37.0	....	29	277	−42.4	....	25	277	−41.7	34	27	270	−48.5	....	27	270	−48.3	....
11,000	29	247	−43.0	....	22	243	−45.8	....	26	246	−45.1	....	27	239	−48.6	....	25	239	−48.0	....	26	232	−52.0	....	27	232	−51.6	....
12,000	29	213	−50.2	....	17	209	−51.8	....	26	212	−53.1	....	23	205	−53.6	....	24	205	−52.8	....	24	198	−53.0	....	25	199	−51.5	....
13,000	28	182	−57.0	....	17	179	−56.5	....	20	181	−60.8	....	21	175	−57.4	....	24	175	−55.4	....	24	170	−52.7	....	22	170	−51.7	....
14,000	24	155	−62.9	....	12	152	−60.3	....	6	154	−67.4	....	19	149	−59.1	....	23	150	−57.0	....	24	145	−53.2	....	19	146	−52.7	....
15,000	20	132	−68.1	....	10	129	−61.9	....					15	128	−61.5	....	19	127	−58.0	....	22	124	−53.7	....	13	124	−53.0	....
16,000	5	112	−74.0	....	8	110	−64.7	....					12	108	−64.0	....	13	109	−59.5	....	21	106	−54.7	....	7	107	−54.1	....
17,000													6	92	−63.2	....	7	93	−61.3	....	14	91	−55.3	....				
18,000																					6	78	−56.0	....				

Altitude (meters) m. s. l.	Swan Island, W. I. (10 m.)				Tacubaya, Mexico (2306 m.)				Tampa, Fla. (3 m.)				Tapachula, Mexico (115 m.)				Tatoosh Is., Wash. (31 m.)				Toledo, Ohio (191 m.)				Tongue Point, Oreg.[1] (21 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	1,011	26.5	85	30	773	17.6	65	30	1,016	25.9	82	27	997	24.2	92	30	1,013	11.3	88	30	991	20.1	81	22	1,016	15.1	73
500	30	956	23.0	84					30	960	23.8	71	27	954	23.4	82	30	958	9.9	77	30	956	20.7	69	22	960	11.9	71
1,000	30	903	20.1	78					30	907	21.0	69	27	901	20.7	80	30	902	9.5	62	30	903	18.0	67	22	904	9.8	67
1,500	30	852	17.5	73					30	856	17.9	66	27	851	18.1	77	30	849	7.7	53	30	851	14.8	66	22	851	8.3	55
2,000	30	803	15.0	69					30	807	14.8	63	27	802	15.5	76	30	798	5.0	52	30	802	11.5	68	22	801	5.8	48
2,500	30	757	12.4	63	30	755	16.1	65	30	759	11.9	60	27	756	13.0	75	30	751	2.4	43	30	755	8.8	61	22	753	3.8	36
3,000	30	713	9.5	63	30	712	12.2	71	30	716	8.7	62	27	712	10.1	76	30	705	−.3	41	30	711	5.8	53	22	708	1.5	....
4,000	30	631	3.7	61	30	632	4.5	57	30	654	3.0	57	25	631	4.1	80	30	622	−6.1	34	30	628	.1	39	22	624	−4.5	....
5,000	29	558	−1.8	59	29	558	−1.7	88	29	560	−2.2	54	23	557	−1.4	80	30	547	−12.2	33	30	554	−5.6	36	22	550	−10.8	....
6,000	29	491	−7.8	64	27	492	−7.2	77	29	493	−8.0	47	23	491	−6.9	77	30	479	−18.9	....	30	487	−11.5	36	20	482	−17.4	....
7,000	29	432	−13.4	60	27	432	−13.2	71	29	433	−14.4	46	23	432	−12.9	74	30	418	−26.5	....	30	427	−18.2	36	19	421	−24.1	....
8,000	29	378	−19.3	49	27	378	−19.4	60	28	378	−21.0	44	22	378	−19.6	67	30	363	−33.8	....	30	373	−25.2	....	13	365	−32.2	....
9,000	29	329	−26.2	42	26	329	−26.4	55	27	329	−28.1	43	22	329	−26.7	63	29	314	−41.1	....	30	324	−32.8	....	11	315	−40.3	....
10,000	29	286	−34.2	....	26	287	−34.3	....	27	286	−35.9	....	22	286	−34.8	60	27	270	−47.8	....	30	280	−40.2	....	10	272	−45.8	....
11,000	28	248	−42.4	....	23	248	−43.1	....	27	247	−44.1	....	19	248	−43.0	....	25	232	−50.5	....	30	242	−47.3	....	8	233	−48.4	....
12,000	27	213	−50.6	....	19	213	−50.8	....	24	212	−52.0	....	18	213	−51.7	....	23	199	−51.4	....	29	207	−53.2	....				
13,000	25	182	−59.3	....	12	182	−59.4	....	20	182	−59.0	....	18	182	−59.7	....	22	170	−50.8	....	24	178	−58.6	....				
14,000	11	155	−66.1	....					12	155	−64.7	....	14	155	−67.5	....	22	146	−51.9	....	20	152	−61.0	....				
15,000																	15	125	−53.6	....	16	129	−62.5	....				
16,000																	9	108	−54.4	....	6	109	−61.3	....				
17,000																	6	92	−54.2	....								

See footnote at end of table.

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by radiosondes during June 1944*—Continued

STATIONS AND ELEVATIONS IN METERS ABOVE SEA LEVEL—Continued

Altitude (meters) m. s. l.	Washington, D. C. (25 m.)				Altitude (meters) m. s. l.	Washington, D. C. (25 m.)				Altitude (meters) m. s. l.	Washington, D. C. (25 m.)				Altitude (meters) m. s. l.	Washington, D. C. (25 m.)			
	Number of observations	Pressure	Temperature	Relative humidity		Number of observations	Pressure	Temperature	Relative humidity		Number of observations	Pressure	Temperature	Relative humidity		Number of observations	Pressure	Temperature	Relative humidity
Surface	30	1,011	22.3	74	2,500	30	757	9.4	55	7,000	29	429	−17.2	37	12,000	28	208	−54.2	----
500	30	957	21.1	65	3,000	30	712	6.6	53	8,000	29	374	−24.6	40	13,000	23	178	−59.5	----
1,000	30	904	18.2	65	4,000	30	630	.7	42	9,000	29	325	−32.3	----	14,000	20	151	−62.5	----
1,500	30	853	15.1	69	5,000	29	556	−4.6	33	10,000	29	282	−40.3	----	15,000	12	129	−62.7	----
2,000	30	803	12.5	63	6,000	29	489	−10.6	31	11,000	29	243	−47.9	----	16,000	6	109	−62.8	----

1. U. S. Navy.
2. Humidity data obtained by hair hygrometer, others using electric hygrometer.

NOTE

All observations taken near 11:00 p. m. E. S. T. except at Mazatlan and Tapachula, Mexico, where they are taken near 9:00 p. m.

"Number of Observations" refers to pressure only, as temperature and humidity data are sometimes missing for some observations at certain levels. Relative humidity data are not used in daily observations when the temperature is below −40.0° C.

None of the means included in these tables are based on less than 15 surface or 5 standard level observations.

Means for observations obtained by the electric hygrometer have been adjusted to compensate for the values occurring below the operating range of the humidity element.

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (75th meridian time) during June 1944. Directions given in degrees from north (N=360°, E=90°, S=180°, W=270°). Velocities in meters per second*

Altitude (meters) m. s. l.	Abilene, Tex. (538 m.)			Albuquerque, N. Mex. (1,630 m.)			Atlanta, Ga. (299 m.)			Billings, Mont. (1,095 m.)			Bismarck, N. Dak. (512 m.)			Boise, Idaho (870 m.)			Brownsville, Tex. (7 m.)			Buffalo, N. Y. (220 m.)			Burlington, Vt. (132 m.)			Charleston, S. C. (17 m.)			Cincinnati, Ohio (152 m.)			Denver, Colo. (1,627 m.)			El Paso, Tex. (1,196 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	174	6.7	30	198	4.7	30	299	1.0	28	41	1.3	29	126	0.5	28	310	3.3	30	123	6.5	29	246	2.3	29	228	1.2	30	162	1.1	30	285	1.3	30	76	1.7	30	213	3.1
500							30	301	2.0										30	133	8.2	29	254	3.9	29	233	2.5	30	166	2.7	30	250	2.6						
1,000	30	166	9.3				30	321	2.7				29	130	0.4	28	306	3.7	27	136	7.1	27	269	4.7	27	270	3.1	27	231	1.1	30	254	3.4						
1,500	30	174	8.5				29	331	2.3	28	64	2.5	28	222	0.2	28	313	2.4	25	145	6.1	23	276	3.5	27	292	4.8	26	283	1.2	30	269	4.9				30	211	3.2
2,000	30	182	8.3	30	194	5.9	27	333	3.8	25	140	0.9	26	228	2.1	27	300	1.6	21	134	4.9	18	279	7.8	19	295	6.0	23	324	3.2	29	276	5.9	30	104	2.1	30	210	3.3
2,500	30	192	6.1	30	202	6.9	25	337	3.7	24	184	1.6	21	237	4.7	26	240	1.5	19	135	4.6	16	298	8.6	15	300	7.7	23	333	4.0	26	289	6.1	30	131	3.0	30	220	4.0
3,000	28	206	6.9	30	210	7.0	21	326	5.6	21	229	3.7	18	254	6.3	26	210	1.2	16	130	5.0	11	300	10.2	11	295	9.1	22	335	4.7	24	291	6.5	29	171	2.8	30	226	4.8
4,000	26	211	6.1	29	217	7.9	18	331	5.3	16	249	7.1	15	254	8.5	22	234	4.4	15	112	5.9				10	314	9.8	17	322	3.7	15	306	7.3	26	222	6.8	28	230	8.2
5,000	23	233	6.3	26	234	10.9	15	317	6.3	15	249	10.9	13	261	8.5	17	243	6.1	13	111	2.8							14	319	4.9	10	306	6.3	24	239	10.1	26	240	10.3
6,000	18	237	6.0	24	237	13.9				13	245	11.8	11	261	13.8	14	248	8.2	12	85	3.5							12	321	7.5				21	242	14.3	25	243	11.4
8,000	12	223	6.0	22	234	17.6																											11	239	20.6	18	235	14.5
10,000	11	210	4.6	19	240	20.2																														12	233	14.4
12,000				17	239	25.6																																

Altitude (meters) m. s. l.	Ely, Nev. (1,910 m.)			Grand Junction, Colo. (1,413 m.)			Greensboro, N. C. (271 m.)			Havre, Mont. (767 m.)			Jacksonville, Fla. (16 m.)			Joliet, Ill. (178 m.)			Las Vegas, Nev. (573 m.)			Little Rock, Ark. (88 m.)			Medford, Oreg. (410 m.)			Miami, Fla. (15 m.)			Mobile, Ala. (66 m.)			Nashville, Tenn. (194 m.)			New York, N. Y. (15 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	211	3.1	30	238	2.6	28	310	1.2	26	258	0.4	29	72	2.4	30	231	2.8	30	199	3.4	30	181	2.1	29	304	2.5	30	130	3.8	29	222	0.8	30	255	1.9	30	211	2.2
500							28	308	1.6				28	89	1.1	30	235	3.9				30	197	2.8	29	303	2.8	30	134	4.5	29	200	0.9	30	257	2.6	30	249	4.0
1,000							28	275	2.4	26	193	1.0	29	330	0.7	27	229	5.5	30	197	5.5	30	217	2.9	29	310	3.1	30	128	2.8	27	268	0.4	30	277	2.7	27	276	4.4
1,500				30	240	3.4	28	286	3.4	26	178	1.2	24	301	2.6	27	243	6.4	30	201	5.2	30	230	3.1	29	302	2.6	30	105	1.6	24	335	1.2	30	299	3.8	28	279	4.9
2,000	30	209	3.8	30	241	4.2	25	296	4.4	24	204	2.9	24	319	3.4	24	255	6.8	30	205	5.4	30	243	3.4	26	329	1.6	28	52	1.5	22	6	2.2	28	294	5.4	22	293	6.3
2,500	30	202	4.2	30	211	4.8	25	303	5.7	21	199	2.7	24	328	4.2	19	261	6.9	30	205	6.3	30	241	3.6	24	307	2.3	27	44	1.3	20	21	2.6	27	296	5.4	22	300	7.2
3,000	30	201	4.7	28	220	6.6	23	311	6.9	19	231	4.2	23	331	3.7	14	270	7.5	30	216	7.4	27	244	3.6	20	320	2.8	26	77	0.6	18	21	2.7	24	299	6.0	14	308	8.9
4,000	25	206	8.3	21	211	9.3	14	317	8.6	15	238	6.5	20	327	3.4				30	228	9.7	23	256	3.4	18	311	5.5	25	160	0.7	16	22	2.4	17	292	6.5			
5,000	17	210	13.2	14	217	12.3							19	339	3.8				28	224	13.5	21	275	3.6	17	296	7.1	23	224	0.8				13	312	7.4			
6,000	15	209	15.7	10	225	13.1							18	339	4.3				26	227	16.2	17	292	4.8	16	296	7.8	18	240	1.5									
8,000	10	221	20.6										15	321	6.2				20	239	17.3	14	294	8.0	12	303	10.7	14	287	2.5									
10,000													13	330	7.7				14	254	22.0	12	295	6.8				12	308	3.8									
12,000													10	325	10.8																								

See footnotes at end of table.

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (75th meridian time) during June 1944. Directions given in degrees from north (N=360° E=90°, S=180°, W=270°). Velocities in meters per second*—Continued

Altitude (meters) m. s. l.	Oakland, Calif. (8 m.)			Oklahoma City, Okla. (402 m.)			Omaha, Nebr. (306 m.)			Phoenix, Ariz. (338 m.)			Rapid City, S. Dak. (982 m.)			St. Louis, Mo. (181 m.)			St. Paul, Minn. (225 m.)			San Antonio, Tex. (240 m.)			San Diego, Calif. (15 m.)			Sault Ste. Marie, Mich. (225 m.)			Seattle Wash. (12 m.)			Spokane, Wash. (603 m.)			Washington D. C. (24 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	264	5.9	30	168	8.5	30	167	2.8	30	254	1.9	28	57	1.0	30	220	2.6	30	214	1.3	30	139	5.0	29	274	4.1	27	270	2.5	29	253	2.2	30	190	1.5	27	278	1.0
500	29	264	4.7	30	170	9.0	30	175	5.3	30	253	2.9	---	---	---	30	222	4.1	30	203	2.7	30	142	5.9	29	278	2.7	27	274	2.6	29	255	1.6	---	---	---	27	285	2.3
1,000	28	264	2.9	30	178	9.4	28	190	6.9	30	246	3.2	28	55	0.9	30	227	4.2	26	214	3.8	29	149	6.8	22	295	1.5	25	230	4.3	21	259	1.7	30	186	1.9	26	290	3.4
1,500	25	268	2.6	29	189	9.8	28	207	7.2	30	228	3.0	28	266	0.6	30	242	5.6	25	234	4.6	28	145	6.1	19	257	1.2	24	246	6.5	20	272	1.6	30	211	2.4	25	300	4.8
2,000	22	310	2.0	25	209	8.8	24	234	9.[illegible]	30	202	4.7	26	224	2.7	29	256	7.1	18	266	7.3	22	150	6.1	19	239	2.0	19	245	7.7	18	154	0.9	26	201	2.1	19	310	5.4
2,500	22	322	2.8	23	212	7.4	19	252	8.7	30	201	6.0	25	239	5.1	26	262	7.8	14	273	8.4	18	157	5.6	18	226	3.4	15	273	8.6	17	186	1.9	25	200	2.2	17	326	5.7
3,000	22	331	3.7	19	215	7.8	17	262	9.9	30	212	8.2	20	244	6.3	24	262	8.4	12	268	9.3	14	158	3.6	17	235	5.6	12	293	8.2	15	189	1.6	18	199	1.9	16	322	6.8
4,000	20	321	7.1	18	234	6.0	14	264	11.9	30	221	11.4	14	254	10.9	17	280	9.3	---	---	---	11	139	2.3	16	243	9.5	10	275	11.0	11	197	2.2	14	232	4.5	15	319	9.1
5,000	20	311	7.6	16	239	5.3	12	275	15.2	28	229	12.5	14	248	13.4	15	285	8.8	---	---	---	---	---	---	13	234	11.0	---	---	---	10	197	1.4	---	---	---	13	316	9.6
6,000	19	308	10.5	13	234	8.7	11	272	15.5	27	236	14.3	14	251	16.7	13	282	11.6	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	12	311	8.4
8,000	17	307	13.4	---	---	---	---	---	---	22	245	16.5	13	250	23.9	12	286	14.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
10,000	15	296	19.5	---	---	---	---	---	---	17	251	21.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
12,000	10	268	17.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

TABLE 3.—*Maximum free air wind velocities (m. p. s.) for different sections of the United States based on pilot balloon observations during June 1944*

Section	Surface to 2,500 meters (m. s. l.)					Above 2,500 to 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station
Northeast [1]	30.6	S.	437	19	Nantucket, Mass.	34.0	NW.	4,970	13	Portland, Maine	63.8	NW.	8,923	4	Caribou, Maine
East-Central [2]	28.6	WSW.	2,042	6	Cincinnati, Ohio	37.6	NNW.	4,473	23	Elkins, W. Va.	50.0	N.	12,064	26	Huntington, W. Va.
						26.0	NW.	3,809	24	Atlanta, Ga.					
Southeast [3]	22.1	NW.	630	24	Jacksonville, Fla.	26.0	NW.	4,788	20	Birmingham, Ala.	48.4	N.	13,090	21	Jacksonville, Fla.
						48.0	WNW.	4,254	17	Detroit, Mich.					
North-Central [4]	38.0	SW.	2,328	28	Duluth, Minn.	48.0	W.	4,080	28	St. Paul, Minn.	60.4	WNW.	11,222	23	Bismarck, N. Dak.
Central [5]	51.0	SSW.	2,330	26	Dodge City, Kans.	43.3	SSW.	2,501	26	Dodge City, Kans.	58.2	W.	7,250	23	Goodland, Kans.
South-Central [6]	35.6	S.	1,386	3	Oklahoma City, Okla	28.9	WSW.	4,957	3	Amarillo, Tex.	43.0	SW.	7,937	3	Amarillo, Tex.
Northwest [7]	28.7	S.	2,350	16	Pocatello, Idaho	36.4	NNW.	3,802	7	Eugene, Oreg.	75.0	NW.	11,770	7	Boise, Idaho.
West-Central [8]	39.9	NNW.	1,544	8	Sacramento, Calif.	45.3	S.	2,763	21	Grand Junction, Colo.	63.0	WSW.	12,927	22	Denver, Colo.
Southwest [9]	31.8	SSW.	2,500	15	Raton, N. Mex.	49.1	W.	3,954	3	Raton, N. Mex.	66.0	WNW.	11,668	16	Santa Maria, Calif.

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee, and North Carolina.
[3] South Carolina, Georgia, Florida, and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and western Tennessee.
[7] Montana, Idaho, Washington, and Oregon.
[8] Wyoming, Colorado, Utah, northern Nevada, and northern California.
[9] Southern California, Southern Nevada, Arizona, New Mexico, and extreme west Texas.

RIVER STAGES AND FLOODS

By C. R. JORDAN

PRECIPITATION during June was below normal over the southern half of the country with the exception of western Texas, New Mexico, western Colorado, and Utah. It was also below normal in the central Lake region and most of Oregon. Extremely dry weather prevailed in the central Appalachians and Atlantic coastal States and drought conditions in this area spread to embrace the major parts of 10 States. In contrast to the dry weather of May in central New England States, the month was the wettest June of record for some localities. Heavy precipitation also occurred over most of the area from the western Lake region westward to the northern Rocky Mountain and the northern Great Basin.

Damaging floods occurred for the third consecutive month in the West Central States of the Mississippi Valley. Local floods occurred in New England, West Virginia, Montana, and Utah.

Hudson Bay Drainage.—Minor floods occurred in the Red River of the North at Wahpeton and Fargo, N. Dak., during the early part of June. The rise resulted from a series of thunderstorms attending a depression which was over the Dakotas on June 3–4. Unofficial amounts of precipitation of 6 to 7 inches were reported at White Rock, S. Dak., and Wheaton, Minn. Only slight damage resulted from the overflow.

Atlantic Slope Drainage.—Local flash floods occurred at several places, particularly in central Massachusetts and southern New Hampshire, where frequent showers and thunderstorms began on June 17 and continued until June 25. Some showers were of torrential intensity with a number of stations averaging more than 5 inches in a matter of a few hours. At Hubbardston, Mass., the Department of Public Health reported a rainfall of 5.76 inches in less than 2 hours on June 25. Many of the smaller streams experienced the highest floods since the hurricane flood of 1938, but crest stages were well below previous maxima.

MISSISSIPPI SYSTEM

Ohio Basin.—Heavy rain accompanying a tornado in the vicinity of Salem, W. Va., on the 23d, caused two streams, Salem Fork and Jacob Run, converging in the business district of Salem, to overflow and flood the main street of the town with 3 to 7 feet of water. Considerable damage was done to crops and gardens and farm lands in the vicinity.

Upper Mississippi Basin.—Outstanding floods occurred in the West Central States for the third consecutive month. As during May, the flood area was centered in Iowa but extended from Wisconsin to Kansas and Oklahoma. Overflows resulted mainly from torrential rains with 24-hour amounts exceeding 5 inches at several places in Iowa. The soil was generally well soaked and most streams were at high levels from the earlier rains of April and May which were important factors contributing to the flood heights reached.

Beginning about June 12 and continuing at intervals until the 27th, heavy to excessive rains, centered in Iowa, built up the prevailing stream stages and caused flash floods on the smaller streams and general floods of less severity on the larger rivers. The crest stage of the Cedar River at Cedar Rapids, Iowa, was 12.4 feet on June 18 and was the highest June stage of record. On June 25 and 26 locally excessive rains, with unofficial amounts up to 10 inches, occurred over the Middle, Cedar, Maquoketa, and Wapsipinicon Basins. A record stage of 24.7 feet resulted at Maquoketa, Iowa, on the 29th. A number of the smaller streams in eastern Iowa reached the highest stages since 1902. Severe floods were reported in the headwaters of the Des Moines River Basin. Flood crests in the Raccoon and Des Moines Rivers were from 1 to 5 feet lower than the floods of May. Moderate to severe flood stages occurred along the Mississippi River from Fort Ripley, Minn., to Chester, Ill., with the highest stages since 1922 reported from Clinton to Muscatine, Iowa.

Missouri Basin.—Heavy rainfall during the early part of June in the Floyd River Valley caused rather serious flood conditions above Sioux City, Iowa, both on the main Floyd River and the West Branch. Rainfall was not only heavy but frequent and much of the damage was caused by rainfall rather than stream overflow. A stage of 19.2 feet was recorded at James, Iowa, on the 16th, the highest stage recorded at this station since it was established about 5 years ago. Moderate overflow occurred along the Big Sioux River from Sioux Falls, S. Dak., to Sioux City, Iowa.

Excessive rainfall at many places in Madison, Stanton, Colfax, Dodge, Cuming, and Burt Counties in Nebraska produced the worst flood in years, if not of record, in the Elkhorn Valley from below Stanton practically to the mouth of the river. Overflow was especially severe in the vicinity of Scribner, Hooper, and Waterloo. Damage amounted to several million dollars.

Light flooding occurred during the month at scattered points along the Solomon, Little Blue, Big Blue, and Grand Rivers.

The "annual rise" of the Missouri River prevailed throughout June, with moderately high stages resulting from the mouth of the Yellowstone River to Omaha, Nebr. The following report was received from the Weather Bureau Regional Office, Kansas City, Mo.:

> On June 11, 1944, the Missouri River in the Kansas City river district was from 3 to 5 feet below flood stage. Snow melt was approaching the annual peak in the upper Yellowstone but had not reached Williston, N. Dak. The flow at Bismarck on this date was about 60,000 cfs. It requires about 100,000 cfs to produce flood stage at Nebraska City. Flow from the Platte and Kansas Rivers was normal.
>
> During the night of June 10–11, torrential rains fell in the Elkhorn Basin, northwest of Omaha. Unofficial measurements indicate amounts as high as 16.0 inches. Heavy rains were general over eastern Nebraska and western Iowa although in most cases the amounts were not in excess of 2.00 inches.
>
> During the night of June 12–13, heavy rains averaging 2 inches fell over the area between Omaha and St. Joseph, indicating that serious flood conditions should be expected from Omaha, Nebr., to St. Joseph, Mo. Stages were extremely high in the Nebraska City–St. Joseph area, the St. Joseph stage being the highest since 1917 and the Nebraska City stage being only 0.2 foot lower than the all-time record stage of 19.9 feet that occurred April 14, 1943. One of the outstanding features of the flood was the prolonged high flow. This was caused by heavy upstream inflow from melting snow and heavy rains in Montana and North Dakota during the period June 17–19. The river was above flood stage at St. Joseph from June 15 to July 7, and at Nebraska City from June 12 to the date of this report (July 14). Below St. Joseph, Mo., there was a flattening-out of the flood crest and only about bankful stages occurred below there. Damage to levees and prospective crops was extremely high due to the long period of inundation.

Arkansas Basin.—Flood stages were slightly exceeded at a number of stations along the tributaries of the Arkansas River and bankful stage was reached on the Arkansas River at Great Bend, Kans. Very little damage resulted from these overflows.

Red Basin.—A few stations along the Ouachita, Black, and Sulphur Rivers remained above flood stage during the early part of June from May floods. The streams fell steadily and were all below flood stage by the middle of the month.

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Lower Mississippi Basin.—Stages in the Atchafalaya and lower Mississippi Rivers fell steadily from high stages that occurred for the most part during the latter part of May.

West Gulf of Mexico Drainage.—Light to moderate flooding continued during the early part of June along the Sabine, Trinity, Guadalupe, Nueces, and Rio Grande Rivers. Overflow was light and little or no damage resulted during June.

FLOOD-STAGE REPORT FOR JUNE 1944

[All dates in June unless otherwise indicated]

River and station	Flood stage	Above flood stages—dates		Crest [1]	
		From—	To—	Stage	Date
HUDSON BAY DRAINAGE	*Feet*			*Feet*	
Red of North:					
Wahpeton, N. Dak.	6	5	8	8.0	6
Moorhead, Minn.	17	7	12	20.0	10
ATLANTIC SLOPE DRAINAGE					
Contoocook: Penacook, N. H.	7	25	27	7.3	26
Nashua: East Pepperel, Mass.	8	25	28	10.8	27
MISSISSIPPI SYSTEM					
Upper Mississippi Basin					
Rock: Moline, Ill.	10	27	27	10.1	27
Cedar: Waterloo, Iowa	12	17	17	13.2	17
Iowa:					
Iowa City, Iowa	16	19	19	16.1	19
Wapello, Iowa	10	18	29	14.3	20–21
				13.0	28
Skunk: Augusta, Iowa	15	18	20	15.2	19
Raccoon: Van Meter, Iowa	13	13	19	17.1	16
Boone: Webster City, Iowa	10	14	16	13.9	14
Des Moines:					
Boone, Iowa	20	14	17	23.6	16
Des Moines, Iowa	23	17	17	23.4	17
Tracy, Iowa	14	9	23	18.8	19
Eddyville, Iowa	15	9	24	20.25	19
Ottumwa, Iowa	9	9	24	12.6	11
				14.3	19–20
Mississippi:					
Fort Ripley, Minn.	10	7	20	11.1	14–15
St. Paul, Minn.	14	20	22	14.2	21
Hastings Dam, Minn.	15	18	23	15.2	21–22
Winona, Minn.	13	23	23	13.0	23
La Crosse, Wis.	12	21	23	12.3	22–23
Dubuque, Iowa	18	26	29	19.0	26
Gordons Ferry, Iowa	13	May 15	3	15.5	May 25
		14	July 6	17.3	28
Clinton, Iowa	16	21	July 3	18.6	28
Le Claire, Iowa	12	28	30	12.3	29
Davenport, Iowa	15	28	July 1	16.5	29
Muscatine, Iowa	15	20	July 5	19.0	30
Keithsburg, Ill.	12	18	July 5	15.4	29
Burlington, Iowa	15	21	(2)	16.6	30
Keokuk, Iowa	12	10	(2)	17.25	22
			7	21.1	May 28–29
Gregory Landing, Mo.	12	May 19		15.8	23
		10	(2)	----	----
Quincy, Ill.	14	9	(2)	19.2	23
				19.6	Apr. 26
Hannibal, Mo.	13	Apr. 21	(2)	22.5	May 28
				19.2	24
				19.2	Apr. 26
			(2)	13.2	May 6, 10
Louisiana, Mo.	12	Apr. 21		19.8	May 28
				13.6	12
				17.0	24–25
Grafton, Ill.	18	May 26	9	21.9	1
		24	(2)	19.1	27–28
Chester, Ill.	27	2	3	27.1	2
Missouri Basin					
Big Sioux: Akron, Iowa	12	12	20	17.0	18
Floyd:					
Merrill, Iowa	13	12	13	13.8	12
James, Iowa	14	5	21	19.2	13
Elkhorn: West Point, Nebr.	12	11	14	14.6	12
Solomon: Beloit, Kans.	18	13	13	18.25	13
		20	21	24.65	21
Little Blue:					
Endicott, Nebr.	11	13	13	12.4	13
Hanover, Kans.	14	4	5	15.4	4
		13	14	17.0	14

FLOOD-STAGE REPORT FOR JUNE 1944—Continued

River and station	Flood stage	Above flood stages—dates		Crest [1]	
		From—	To—	Stage	Date
MISSISSIPPI SYSTEM—continued					
Missouri Basin—continued					
Big Blue:	*Feet*			*Feet*	
Beatrice, Nebr.	16	13	14	20.2	13
Barnston, Nebr.	18	4	5	22.2	4
		13	15	23.85	14
		20	21	22.2	20
Blue Rapids, Kans.	20	4	5	23.5	4–5
		13	15	25.9	13–14
Grand:					
Gallatin, Mo.	20	9	10	22.8	10
Chillicothe, Mo.	18	9	11	27.0	11
Brunswick, Mo.	12	10	(2)	14.4	15
				15.5	21
Missouri:					
Blair, Nebr.	18	13	(2)	19.6	17
				----	----
Nebraska City, Nebr.	15	12	(2)	19.7	15
St. Joseph, Mo.	17	14	(2)	19.1	18–19
Kansas City, Mo.	22	20	21	22.1	21
		24	24	22.3	24
Lexington, Mo.	22	16	29	23.8	20
Waverly, Mo.	18	13	(2)	20.9	20
Boonville, Mo.	21	21	24	21.3	22
St. Charles, Mo.	25	24	26	25.05	25
Arkansas Basin					
Cimarron: Perkins, Okla.	11	14	14	11.9	14
Neosho: Oswego, Kans.	17	21	22	18.4	21
North Canadian: Yukon, Okla.	11	13	14	15.0	13
Poteau: Poteau, Okla.	21	14	15	24.0	14
Petit Jean: Danville, Ark.	20	15	16	20.3	15
Arkansas: Great Bend, Kans.	8	3	3	8.0	3
Red Basin					
Ouachita: Monroe, La.	40	May 3	12	45.5	May 18–19
Black: Jonesville, La.	50	May 4	16	53.4	May 23–24
Sulphur:					
Hagansport, Tex.	38	May 27	1	39.2	May 28
Naples, Tex.	22	May 29	9	26.6	1
Lower Mississippi Basin					
				30.8	Mar. 29
Yazoo: Yazoo City, Miss.	29	Mar. 28	3	33.65	Apr. 27
				34.1	May 5
Mississippi:					
Red River Landing, La.	45	Apr. 28	1	50.8	May 18–19
Baton Rouge, La.	35	Apr. 24	2	41.3	May 17–23
Donaldsonville, La.	28	Apr. 29	1	32.6	May 18–23
Reserve, La.	22	May 1	30	23.3	May 18–22
New Orleans, La.	17	May 2	30	19.4	May 21
Atchafalaya:					
Simmesport, La.	41	May 5	1	45.45	May 22
Melville, La.	37	Apr. 28	3	41.4	May 20–23
Atchafalaya, La.	25	Apr. 10	8	26.4	May 22–28
Morgan City, La.	6	2	6	6.3	5
		9	10	6.0	9–10
WEST GULF OF MEXICO DRAINAGE					
Sabine:					
Gladewater, Tex.	26	3	12	30.9	6
Logansport, La.	25	May 1	4	35.05	May 6
				34.6	May 15
Bon Wier, Tex.	17	May 3	14	22.6	May 10
				21.5	May 28–29
East Fork: Rockwall, Tex.	10	7	8	10.7	8
Trinity:					
Rosser, Tex.	26	May 26	5	29.3	3
Trinidad, Tex.	28	May 26	8	32.2	7
Liberty, Tex.	24	8	15	24.8	11–12
Guadalupe: Victoria, Tex.	21	May 30	2	23.5	1
Nueces: Cotulla, Tex.	15	May 30	May 31	15.7	May 31
Rio Grande:					
		May 11	8	6.1	May 18
Lobatos Bridge, Colo.	4			5.6	May 26, June 3
		12	18	4.6	12
Embudo, N. Mex.	8	May 12	8	11.2	May 18–19
				10.0	3
Espanola, N. Mex.	7	May 11	6	8.9	May 17
				8.0	3
GULF OF CALIFORNIA DRAINAGE					
Animas: Durango, Colo.	4	----	----	5.7	11

[1] Provisional.

[2] Continued at end of month.

CLIMATOLOGICAL DATA

CONDENSED CLIMATOLOGICAL SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS

[For description of tables and charts, see REVIEW Jan. 1943, p. 15]

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

Section	Temperature								Precipitation					
			Monthly extremes								Greatest monthly		Least monthly	
	Section average	Departure from the normal	Station	Highest	Date	Station	Lowest	Date	Section average	Departure from the normal	Station	Amount	Station	Amount
	°F.	°F.		°F.			°F.		In.	In.		In.		In.
Alabama	81.1	+2.8	3 stations	104	[1]18	Huntsville	48	8	2.80	−1.45	Lockhart	9.06	Greensboro	0.35
Arizona	71.2	−4.1	2 stations	116	[1]29	Fort Valley	19	17	.06	−.30	Apache Powder Co.	.91	72 stations	.00
Arkansas	79.2	+2.0	5 stations	102	[1]17	4 stations	48	[1]7	3.04	−.99	White Rock	10.30	Portland	.34
California	63.7	−4.3	2 stations	120	30	Tamarack	17	3	.50	+.17	Shasta Dam	4.80	43 stations	.00
Colorado	60.8	−.9	Las Animas	105	20	Pearl	19	18	.91	−.50	Box Ranch	2.50	Saguache	.00
Florida	82.0	+2.1	Madison	106	24	Okeechobee	58	23	5.25	−1.52	St. Leo	11.80	West Palm Beach	.25
Georgia	80.7	+2.5	Eastman	106	24	Tallapoosa	46	8	2.68	−1.76	Fargo	7.14	Hartwell	.19
Idaho	57.5	−2.7	Grand View	104	30	Big Creek	18	14	3.18	+1.81	Dubois	8.26	Weiser	1.01
Illinois	76.0	+3.7	Olney	106	28	Bloomington	35	7	2.42	−1.50	Galena	8.12	Morrisonville	.27
Indiana	75.6	+3.9	Madison	107	28	2 stations	38	7	1.80	−2.06	Waterloo	5.35	Jeffersonville	.18
Iowa	71.7	+2.0	2 stations	101	25	Sibley	38	7	5.88	+1.19	Clarence	11.93	Blockton	1.56
Kansas	75.4	+1.5	Lincoln	112	22	3 stations	41	[1]6	2.93	−1.09	Hanover (1)	9.97	Richfield	.30
Kentucky	77.6	+3.6	Owensboro	107	28	2 stations	40	7	1.70	−2.44	Science Hill	6.14	Beaver Dam	.10
Louisiana	82.0	+1.9	2 stations	103	[1]21	Tallulah	57	8	2.16	−2.56	Franklin	8.73	Coushatta	.12
Maryland-Delaware	72.6	+1.8	Fort George G. Meade, Md.	101	18	Oakland, Md.	29	8	3.04	−.91	Friendsville, Md.	5.64	Millington, Md.	1.26
Michigan	66.2	+1.8	Adrian	102	27	Kenton	28	7	4.16	+1.02	Watersmeet	10.47	Bay City	1.17
Minnesota	65.6	+.7	3 stations	99	25	2 stations	31	[1]7	6.50	+2.39	Milaca	15.00	Milan	2.10
Mississippi	81.5	+2.5	Europa	104	17	Edinburg	50	8	1.81	−2.36	Beaumont	4.88	Belzoni	.09
Missouri	76.4	+2.7	Poplar Bluff	107	[1]17	Louisiana	39	7	2.55	−2.13	Carthage	9.10	Cuba	.14
Montana	57.5	−2.2	3 stations	96	30	2 stations	25	[1]5	5.35	+2.77	Lame Deer	12.04	Kalispell	1.46
Nebraska	69.2	−.2	Gothenburg	104	26	Gordon	29	6	4.26	+.59	Tekamah	13.55	Sidney	.96
Nevada	60.1	−4.3	Overton	114	30	Mariette Lake	18	8	1.07	+.55	Golliher Pasture	5.67	8 stations	.00
New England	64.0	−.1	Westfield, Mass.	101	29	3 stations	26	4	5.05	+1.55	Hubbardston, Mass.	11.82	New Haven, Conn.	1.19
New Jersey	70.4	+1.4	Canoe Brook	100	18	Runyon	33	8	4.08	+.25	Plainfield	8.06	Barnegat City	.69
New Mexico	67.9	−.9	Maljamar	111	16	Birmingham Ranch	15	[1]16	.94	−.33	Bellview	7.28	9 stations	.00
New York	66.4	+1.2	Middleburg	101	28	Indian Lake	26	4	4.44	+.79	Glens Falls (near)	9.86	Orient	1.08
North Carolina	76.8	+2.6	2 stations	105	[1]18	Mount Mitchell	36	21	2.37	−2.29	Greenville	6.83	Wilson	.40
North Dakota	61.7	−1.2	Hankinson	93	[1]24	Dickinson	30	6	6.43	+2.91	Mohall	14.01	Jamestown	1.61
Ohio	73.1	+3.4	Wilmington	104	28	Millport	38	8	3.08	−.81	Beverly	6.75	Mt. Lookout	.35
Oklahoma	79.3	+2.0	Beaver	108	20	Kenton	44	5	3.67	−.24	Tahlequah	10.05	Beaver	.31
Oregon	57.0	−2.5	2 stations	102	30	Round Grove	20	13	2.18	+.88	Valley Falls	5.53	Eugene Airport	.49
Pennsylvania	69.3	+1.1	Sharon	100	[1]18	2 stations	29	8	4.51	+.38	Freeland	8.20	Mercer	1.10
South Carolina	80.4	+2.7	Calhoun Falls	106	19	Walhalla	48	21	3.03	−1.71	Blackville	6.68	Walhalla	.34
South Dakota	64.7	−1.6	Yankton	101	25	Custer	24	6	5.27	+1.78	Bison	9.88	Oelrichs	2.32
Tennessee	78.2	+3.3	Etowah	103	18	Rugby	40	8	2.14	−2.01	Halls	5.86	Knoxville Airport	.20
Texas	81.2	+1.0	4 stations	106	[1]20	Muleshoe	45	5	1.81	−1.18	Bonham	6.26	Freeport	.00
Utah	60.1	−4.4	St. George	106	29	Bryce Canyon	23	17	2.21	+1.56	Brigham City	5.94	Gunlock (near)	.03
Virginia	74.1	+2.2	Diamond Springs	106	19	2 stations	34	8	2.35	−1.82	Monterey	4.80	New Canton	.89
Washington	61.0	.0	Wahluke (near)	103	29	Mt. Adams R. S.	29	2	1.47	−.12	Northport	3.84	Mt. Adams R. S.	.27
West Virginia	71.9	+2.0	Hinton	103	18	2 stations	28	8	4.19	−.27	Pickens	9.45	Kearneysville	1.01
Wisconsin	67.5	+2.3	Kenosha	99	28	Laona	26	7	6.04	+1.90	Mellen	10.00	Milwaukee (City)	2.47
Wyoming	56.4	−2.2	Torrington	100	25	Foxpark	21	29	3.41	+1.74	Rockypoint	10.39	Laramie Airport	.50
Alaska (May)	42.5	+.9	Circle Hot Springs	80	23	2 stations	−12	7	2.85	+1.22	Whittier	35.84	Gulkana	.07
Hawaii	73.2	−.2	Waiane (Oahu)	93	22	Haleakala, R. S.	41	[1]2	4.98	+.19	Kahana (Oahu)	24.77	8 stations	.00
Puerto Rico	78.5	+.3	Dos Bocas	95	[1]6	Guineo Reservoir	57	22	8.95	+2.73	Rio Blanco (1800)	26.00	Sabana Grande	1.14

[1] Other dates also.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS

District and station	Elevation of instruments: Barometer above sea level	Thermometer above ground	Anemometer above ground	Pressure: Station	Sea level	Departure from normal	Temperature of the air: Mean max. + mean min. ÷2	Departure from normal	Maximum	Date	Mean maximum	Minimum	Date	Mean minimum	Greatest daily range	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Departure from normal	Days with 0.01 inch or more	Wind: Average hourly velocity	Prevailing direction	Maximum velocity: Miles per hour	Direction	Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Number of days with thunderstorms
New England	*Ft.*	*Ft.*	*Ft.*	*Mbs.*	*Mbs.*	*Mbs.*	°F. 63.7	°F. +0.7	°F.		°F.	°F.		°F.	°F.	°F.	% 78	*In.* 4.18	*In.* +1.2		*Mi.*								0–10 6.4	*In.*	*In.*	
Eastport	75	67	85	1,008.8	1,011.9	−1.6	54.4	−.7	89	28	62	38	3	46	37	48	84	3.10	+.1	13	9.5	sw.	33	e.	25	8	10	12	6.0	0.0	0.0	4
Greenville, Maine	1,070	6	41	973.6	1,012.9	.....	58.6	−.6	95	29	72	27	4	45	45	52	...	3.22	−.5	14	.....	nw.	.....	.....	.....	6	11	13	.....	.0	.0	3
Portland, Maine[1]	103	5	43	1,008.1	1,012.2	−2.0	61.2	−1.3	96	29	71	33	4	51	32	56	82	5.42	+2.1	11	9.5	s.	29	s.	5	11	8	11	5.5	.0	.0	4
Concord[1]	289	4	45	1,001.7	1,012.2	−2.4	64.0	+2.3	97	29	76	35	4	52	38	54	74	10.10	+6.9	13	8.0	nw.	30	nw.	3	10	8	12	6.0	.0	.0	8
Burlington[1]	403	6	51	997.0	1,011.9	−2.7	65.0	−.7	96	29	76	37	4	54	34	56	75	4.06	+.7	13	9.6	s.	35	s.	5	3	12	15	7.1	.0	.0	6
Boston[1]	124	33	62	1,007.5	1,012.2	−2.4	67.0	+.5	95	29	76	47	4	58	31	56	72	5.35	+2.5	11	11.2	sw.	38	nw.	16	5	9	16	7.1	.0	.0	7
Nantucket	12	11	59	1,011.9	1,012.9	−2.3	62.8	+1.8	85	18	70	42	5	56	29	56	85	2.62	.0	8	10.9	sw.	34	ne.	3	8	5	17	6.5	.6	.0	3
Block Island	26	11	46	1,011.5	1,012.9	−2.0	63.6	+1.8	81	18	71	45	5	57	26	58	86	2.94	+.3	9	13.9	sw.	37	s.	19	9	8	13	6.2	.0	.0	4
Providence[2]	159	46	60	1,006.8	1,013.2	−1.7	68.6	+.3	94	29	78	47	5	59	32	56	74	4.16	+1.5	10	9.0	sw.	29	sw.	6	3	12	15	7.0	.0	.0	5
Hartford[1]	159	5	44	1,006.8	1,012.9	−2.0	67.8	+.7	93	29	79	44	5	57	32	58	74	3.81	+.7	9	8.5	s.	26	s.	6	6	11	13	6.5	.0	.0	8
New Haven	107	5	39	1,008.5	1,012.9	−2.0	67.4	+4.1	90	17	77	43	8	58	29	58	75	1.19	−1.6	11	6.7	sw.	25	se.	19	7	13	10	6.1	.0	.0	5
Middle Atlantic States							72.5	+1.9									72	3.61	0.0										5.9			
Albany[1]	97	26	40	1,008.5	1,012 2	−2.7	67.3	+.6	96	29	78	44	8	57	32	56	71	6.78	+3.7	11	8.5	s.	28	nw.	16	4	14	12	6.4	.0	.0	7
Binghamton[2]	871	60	79	981.7	1,013.2	−1.7	67.4	+1.8	95	29	78	39	8	57	34	59	82	3.59	+.2	12	5.3	w.	24	nw.	29	3	11	16	7.2	.0	.0	11
New York	415	414	454	1,001.4	1,012.9	−2.3	70.4	+1.6	90	27	78	51	5	62	24	58	70	3.38	.0	10	14.0	n.	42	nw.	29	9	12	9	5.7	.0	.0	6
Harrisburg[1]	374	30	49	1,000.0	1,013.5	−2.1	72.0	+1.7	96	18	83	44	8	61	33	62	74	5.49	+1.9	11	7.5	nw.	36	no.	18	3	11	16	7.0	.0	.0	10
Philadelphia[1]	114	6	56	1,009.1	1,013.5	−1.7	72.2	+1.6	95	18	82	50	8	62	28	60	68	3.23	.0	9	9.1	sw.	32	se.	18	5	13	12	6.2	.0	.0	7
Reading	323	47	306	1,000.7	1,013.5	.....	71.9	+1.5	95	29	82	47	8	62	29	.....	.....	4.50	+1.0	10	10.3	nw.	49	ne.	18	5	13	12	6.4	.0	.0	8
Scranton	805	72	104	984.8	1,013.5	−1.7	68.8	+1.0	94	29	78	41	8	59	31	.....	.....	5.66	+2.0	13	6.3	sw.	24	n.	18	4	15	11	6.2	.0	.0	7
Atlantic City	52	37	172	1,011.2	1,013.2	−2.0	69.8	+3.2	91	17	77	51	8	63	29	63	83	4.21	+1.2	11	14.2	s.	50	sw.	19	12	11	7	5.1	.0	.0	8
Trenton	190	89	107	1,006.4	1,013.2	.....	71.2	+1.7	93	29	81	48	5	61	27	60	68	5.47	+2.4	8	8.4	sw.	23	nw.	18	6	13	11	5.9	.0	.0	7
Baltimore[2]	123	100	215	1,009.1	1,013.9	−1.7	74.7	+2.0	97	18	84	51	8	66	26	62	67	2.55	−1.3	10	9.8	s.	37	nw.	19	7	16	7	5.3	.0	.0	8
Washington[2]	112	86	100	1,009.8	1,014.2	−1.7	74.8	+2.6	97	18	85	50	8	65	28	62	68	2.78	−1.4	7	7.1	s.	26	w.	24	6	19	5	7.0	.0	.0	6
Cape Henry	18	8	54	1,012.9	1,013.9	.....	75.5	+2.6	104	19	83	59	12	68	34	66	76	1.88	−2.1	5	11.1	se.	40	n.	19	13	13	4	4.3	.0	.0	6
Lynchburg	686	144	184	990.2	1,014.6	−1.7	76.4	+1.8	98	29	88	52	8	65	32	62	68	2.23	−1.6	11	6.5	nw.	32	nw.	19	10	12	8	4.9	.0	.0	10
Norfolk[2]	91	80	125	1,010.8	1,014.6	−1.3	77.6	+3.2	101	19	86	58	5	69	30	66	73	1.24	−3.0	5	9.0	w.	26	nw.	19	8	17	5	5.3	.0	.0	5
Richmond	144	11	52	1,008.5	1,013.5	−2.8	76.9	+2.8	103	19	88	55	8	66	31	63	68	1.29	−2.6	8	7.2	sw.	37	nw.	19	9	16	5	4.9	.0	.0	5
South Atlantic States							80.2	+3.7									72	3.64	−1.6										4.8			
Asheville	2,253	77	92	938.7	1,015.9	−.4	73.0	+4.3	94	18	85	50	21	61	36	60	72	1.97	−2.0	7	6.5	nw.	30	nw.	19	10	13	7	5.2	.0	.0	12
Charlotte[2]	779	63	86	987.1	1,014.9	−1.4	80.8	+5.3	102	19	92	58	21	69	31	65	66	2.66	−1.6	11	5.8	sw.	24	n.	2	11	16	3	4.8	.0	.0	13
Greensboro[1]	886	6	56	984.1	1,015.2	.....	76.9	.....	100	19	90	50	21	64	40	63	67	1.26	.....	7	7.0	n.	32	nw.	1	10	14	6	4.8	.0	.0	8
Hatteras	11	5	50	1,013.5	1,014.2	−2.1	78.5	+2.9	95	24	85	65	5	72	21	71	81	.44	−4.1	5	11.0	sw.	29	nw.	25	8	15	7	5.3	.0	.0	5
Raleigh[1]	376	27	69	1,001.0	1,014.6	−1.7	79.0	+3.3	102	18	91	56	5	67	34	64	69	1.66	−2.7	6	8.6	sw.	35	nw.	24	11	12	7	4.8	.0	.0	8
Wilmington	72	73	107	1,011.9	1,014.2	−2.1	79.7	+2.9	100	18	89	60	5	70	27	70	77	2.65	−2.4	6	8.4	sw.	26	se.	7	12	15	3	4.6	.0	.0	9
Charleston[2]	48	11	92	1,012.5	1,014.2	−2.1	82.0	+3.1	104	24	90	66	21	74	28	70	79	4.76	+.2	9	9.2	s.	31	n.	2	9	13	8	5.4	.0	.0	17
Columbia, S. C.[2]	347	70	91	1,002.0	1,014.2	−2.1	81.8	+3.7	103	18	93	62	21	70	34	68	68	4.63	+.5	6	6.6	s.	34	se.	4	11	11	8	4.9	.0	.0	9
Greenville, S. C.[1]	1,040	18	36	1,978.3	1,014.9	.....	79.4	+5.3	100	18	91	56	21	68	34	63	64	2.12	−2.4	6	8.0	ne.	40	n.	2	10	13	7	4.8	.0	.0	9
Augusta[2]	[3]182	62	77	1,007.5	1,014.2	−2.1	82.8	+3.9	103	23	94	63	22	71	36	66	65	2.55	−2.1	8	5.3	nw.	22	nw.	2	15	9	6	4.2	.0	.0	12
Savannah[2]	65	73	152	1,012.5	1,014.9	−1.4	83.4	+4.4	103	24	93	68	22	74	32	71	78	3.64	−1.6	8	9.2	w.	32	nw.	24	10	13	7	4.8	.0	.0	12
Jacksonville[1]	43	86	110	1,013.2	1,015.2	−1.1	82.0	+2.1	100	24	91	69	1	73	26	72	77	6.38	+1.0	9	7.6	sw.	28	nw.	13	14	9	7	4.6	.0	.0	12
Florida Peninsula							82.7	+2.0									75	3.25	−3.0										4.8			
Key West[2]	21	10	64	1,013.9	1,014.9	−.7	84.0	+2.1	91	23	88	74	2	79	14	74	74	1.34	−2.9	6	8.5	e.	18	se.	28	12	16	2	4.2	0.0	0.0	5
Miami[2]	25	242	249	1,013.9	1,015.2	−.7	81.0	+1.0	94	24	86	69	26	76	21	72	76	2.21	−5.0	11	11.0	se.	34	se.	25	11	16	3	4.7	.0	.0	9
Tampa[1]	35	6	43	1,013.9	1,015.2	−1.1	83.1	+2.9	97	23	92	70	6	75	24	73	76	6.20	−1.0	12	8.2	w.	45	ne.	25	6	17	7	5.5	.0	.0	21
East Gulf States							81.8	+3.1									72	2.90	−1.8										4.5			
Atlanta[1]	1,173	33	72	974.3	1,014.6	−1.7	80.2	+3.5	101	18	91	59	8	69	30	64	63	.74	−3.2	7	8.2	nw.	32	nw.	14	12	11	7	5.0	.0	.0	12
Macon[2]	370	79	87	1,001.4	1,014.6	−1.7	81.5	+2.6	101	23	94	58	8	70	35	66	66	1.14	−2.9	6	5.8	n.	26	nw.	24	15	7	8	4.4	.0	.0	10
Thomasville	273	49	58	1,005.4	1,015.6	−.3	82.9	+3.4	101	23	94	63	21	71	32	.....	.....	1.50	−4.0	6	.....	.....	.....	.....	.....	5	17	8	.....	.0	.0	9
Apalachicola	35	11	51	1,013.5	1,014.9	.....	82.0	+2.2	98	24	89	71	28	75	19	72	76	3.64	−2.0	12	7.0	w.	30	ne.	1	11	11	8	4.9	.0	.0	16
Pensacola	56	54	79	1,013.2	1,015.2	−.4	83.0	+3.7	99	24	91	70	10	75	25	72	76	6.64	+2.0	11	6.2	w.	22	se.	28	13	13	4	4.1	.0	.0	14
Anniston	741	9	.....	.....	.....	.....	79.0	+2.4	100	23	92	51	8	66	40	.....	.....	3.09	−1.0	8	.....	nw.	.....	.....	.....	13	16	1	.....	.0	.0	10
Birmingham[1]	700	5	62	990.9	1,015.2	−.4	79.6	+2.8	100	23	92	54	8	67	37	66	70	3.76	.....	11	6.1	e.	41	n.	15	9	17	4	4.9	.0	.0	10
Mobile[2]	57	86	161	1,013.2	1,015.0	−.6	83.2	+2.9	100	18	92	68	8	74	26	70	75	5.76	+.3	10	5.3	s.	18	ne.	19	14	9	7	4.5	.0	.0	10
Montgomery[2]	218	92	105	1,007.5	1,015.2	−.7	82.6	+3.0	101	18	93	63	8	72	30	68	70	1.47	−2.3	8	6.2	nw.	25	n.	19	13	13	4	4.0	.0	.0	10
Meridian[2]	375	67	92	1,001.7	1,014.9	−.3	81.4	+3.3	100	18	93	58	8	70	34	68	68	4.10	−.4	8	4.7	e.	29	s.	2	16	10	4	3.9	.0	.0	8
Vicksburg[2]	247	82	102	1,006.1	1,014.6	−.3	82.0	+3.0	97	21	92	64	7	72	25	70	80	1.73	−2.3	6	6.9	s.	34	e.	28	10	14	6	4.8	.0	.0	8
New Orleans[4]	53	76	84	1,012.9	1,014.6	−.6	83.8	+4.2	98	21	92	70	4	76	21	73	74	2.09	−3.8	11	5.5	se.	20	ne.	6	12	14	4	4.4	.0	.0	13
West Gulf States							82.4	+2.3									75	1.47	−2.2										5.1			
Shreveport[1]	249	5	64	1,005.4	1,014.2	−.4	83.0	+2.6	98	21	93	64	7	73	24	71	74	.94	−2.6	6	8.3	s.	42	s.	8	11	16	−3	4.3	.6	.0	6
Fort Smith	463	57	82	996.6	1,012.5	−1.4	80.8	+3.3	98	26	90	57	7	71	27	70	72	4.45	+.7	9	7.8	e.	31	ne.	29	8	14	8	5.6	.0	.0	11
Little Rock[1]	357	5	58	1,001.7	1,014.6	.0	81.0	+3.6	98	27	92	58	8	70	29	68	72	1.54	−2.2	6	7.5	sw.	34	sw.	12	11	16	3	4.3	.0	.0	7
Austin[1]	605	10	41	991.5	1,012.5	.....	81.0	−.2	94	20	90	65	6	72	23	70	74	2.01	−.4	8	9.9	s.	24	s.	3	2	24	4	5.8	.0	.0	4
Brownsville[1]	57	5	54	1009.5	1,011.2	.....	83.1	+.7	93	17	90	70	29	76	19	74	81	1.91	−1.3	6	12.1	se.	29	s.	4	0	23	7	5.9	.0	.0	3
Corpus Christi[1]	20	4	33	1,011.9	1,012.5	−.4	82.2	+2.7	93	25	90	70	29	75	21	74	81	.17	.....	2	12.2	se.	27	se.	3	19	8	3	3.8	.0	.0	4
Dallas[1]	512	5	45	994.2	1,012.2	.....	84.0	+3.6	100	20	94	63	7	74	23	69	66	.28	−3.6	4	13.0	s.	34	se.	9	8	18	4	5.2	.0	.0	1
Fort Worth[1]	679	5	56	988.8	1,011.9	−1.3	83.1	+3.2	99	20	92	63	7	74	23	68	66	.76	−2.6	4	13.0	s.	29	s.	9	9	14	7	5.5	.0	.0	2
Galveston[2]	54	106	114	1,011.9	1,013.9	−.3	82.6	+1.9	91	20	86	73	29	79	11	74	76	.47	−3.9	3	10.7	s.	25	se.	13	13	16	1	4.1	.0	.0	1
Houston[2]	138	157	190	1,008.8	1,013.5	.....	83.4	+2.0	99	24	91	70	6	75	22	72	80	1.63	−2.9	4	10.1	se.	26	se.	12	7	18	5	5.6	.0	.0	6
Palestine	510	64	72	996.3	1,013.9	.0	81.4	+2.4	95	25	90	67	6	72	23	70	74	1.03	−2.6	4	7.5	s.	26	s.	11	5	22	3	4.7	.0	.0	3
Port Arthur	24	59	134	1,012.9	1,013.9	.....	84.0	+3.0	96	26	91	69	6	78	22	74	79	1.02	−3.8	6	11.6	s.	26	s.	28	11	16	3	4.5	.6	.0	5
San Antonio[1]	603	6	51	988.2	1,011.9	−.6	81.3	+.3	95	20	90	64	6	73	24	70	76	1.64	−.8	6	9.9	se.	34	e.	29	1	23	6	6.5	.0	.0	3

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station	Pressure: Sea level	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean temperature of the dew point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Number of days with thunderstorms
	Ft.	*Ft.*	*Ft.*	*Mbs.*	*Mbs.*	*Mbs.*	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	%	*In.*	*In.*		*Mi.*								*0–10*	*In.*	*In.*	
Ohio Valley and Tennessee							76.5	+4.5									69	2.12	−1.8										4.8			
Chattanooga [1]	762	6	66	988.5	1,015.2	−.7	78.7	+5.5	100	18	92	51	8	65	38	66	70	.94	−3.2	6	6.2	s.	41	nw.	14	9	16	5	5.0	.0	.0	10
Knoxville [1]	995	27	53	980.4	1,015.2	−.4	79.0	+5.2	102	18	91	54	21	66	36	62	62	.20	−3.9	4	7.2	ne.	28	nw.	3	11	17	2	4.2	.0	.0	10
Memphis [4]	399	5	86	1,000.3	1,014.2	−.7	81.0	+4.6	99	17	92	57	8	70	32	69	70	2.44	−1.1	5	7.0	sw.	27	w.	13	12	14	4	4.3	.0	.0	5
Nashville [1]	546	5	72	995.3	1,014.9	−.7	80.8	+5.2	100	23	93	52	8	68	40	64	63	1.33	−2.7	4	7.4	s.	40	w.	14	7	21	2	4.8	.0	.0	4
Lexington	989	6	----	980.4	1,015.6	−.3	77.5	+5.3	103	28	91	46	8	64	38	----	----	1.58	−2.5	10	----	w.	----	----	----	17	13	0	3.0	.0	.0	12
Louisville [3]	525	106	120	995.6	1,014.2	−1.0	79.7	+5.0	102	28	88	55	7	71	23	63	64	.49	−3.3	5	8.2	sw.	28	sw	14	8	20	2	4.7	.0	.0	6
Evansville [1]	431	12	40	999.0	1,013.9	−1.0	78.0	+6.1	101	28	90	46	7	66	34	64	64	1.61	−2.4	6	6.8	sw.	34	sw.	14	7	17	6	5.4	.0	.0	8
Indianapolis [1]	823	5	54	984.8	1,014.2	−.7	74.0	+4.1	99	28	85	43	7	63	30	63	72	2.32	----	8	8.8	sw.	36	sw.	13	6	19	5	5.0	.0	.0	7
Terre Haute [3]	575	68	149	993.9	1,014.2	----	77.7	+4.9	102	28	88	49	7	67	27	63	68	1.24	−2.7	9	8.6	s.	39	sw.	14	12	15	3	4.6	.0	.0	8
Cincinnati [3]	627	11	51	991.9	1,014.2	−1.4	76.9	+5.7	102	27	89	47	7	65	33	63	68	.59	−3.1	6	6.2	sw.	20	nw.	19	8	18	4	4.7	.0	.0	7
Columbus [3]	822	90	110	985.4	1,014.2	−1.4	75.5	+4.6	102	28	86	48	7	65	30	62	70	2.30	−1.0	8	8.9	s.	33	sw.	25	8	17	5	5.4	.0	.0	7
Dayton [1]	1,003	6	55	978.7	1,014.6	----	75.2	+4.3	99	28	86	46	7	64	29	60	66	1.18	−2.6	5	10.1	sw.	40	nw.	14	5	20	5	5.3	.0	.0	7
Elkins [3]	1,947	61	78	947.9	1,015.6	−.3	68.2	+1.3	89	18	80	37	8	57	37	60	84	7.76	+2.7	16	5.1	w.	24	s.	23	4	13	13	6.6	.0	.0	13
Parkersburg	637	77	84	991.9	1,014.9	−1.0	74.3	+2.9	98	18	86	44	8	63	33	63	72	3.44	−.6	11	6.1	se.	27	w.	16	14	15	1	3.7	.0	.0	10
Pittsburgh [1]	842	39	54	984.1	1,014.2	−1.4	71.4	+2.8	94	28	82	44	8	60	30	59	70	4.60	+.8	15	9.7	sw.	42	nw.	19	6	19	5	5.5	.0	.0	13
Lower Lake Region							69.0	+3.0									73	3.97	+0.6										5.8			
Buffalo	768	34	96	985.4	11,013.2	−1.7	67.1	+2.2	95	28	77	45	7	57	34	58	78	3.95	+1.1	11	12.1	sw.	37	nw.	24	3	13	14	6.6	.0	.0	5
Canton	448	10	61	995.9	1,012.2	----	64.8	+1.3	92	28	76	37	4	54	36	55	74	3.50	+.2	12	7.7	w.	24	sw.	7	4	15	11	6.4	.0	.0	7
Oswego	335	71	85	1,000.3	1,012.5	−2.4	63.6	−1.2	96	28	72	43	8	55	30	56	76	3.13	−.1	13	8.1	w.	22	n.	3	8	12	10	5.7	.0	.0	5
Rochester [1]	523	5	69	993.9	1,013.2	−1.7	67.0	+1.9	98	28	77	45	9	57	34	56	72	3.42	+.4	14	8.7	sw.	40	nw.	16	3	10	17	6.8	.0	.0	7
Syracuse [1]	396	5	57	991.2	1,012.5	−2.4	66.6	+2.1	95	28	76	44	8	57	33	59	77	5.89	+2.0	13	8.6	sw.	42	w.	16	2	12	16	7.2	.0	.0	10
Erie [3]	714	57	81	----	1,013.5	−1.7	69.2	+3.0	95	27	77	49	7	61	----	----	----	3.91	+.6	10	7.3	w.	24	nw.	21	9	11	10	5.7	.0	.0	3
Cleveland [1]	762	27	54	986.5	1,013.9	−1.3	72.4	+4.7	101	28	83	49	7	62	34	60	70	3.04	−.1	10	9.4	s.	37	w.	23	5	20	5	5.6	.0	.0	11
Sandusky	629	5	67	990.9	1,013.9	−1.3	73.1	+4.3	98	28	83	48	7	63	28	----	----	5.00	+1.5	11	8.2	sw.	26	nw.	23	10	14	6	4.9	.0	.0	9
Toledo [1]	628	5	47	991.2	1,013.9	−1.0	71.6	+4.4	99	28	83	42	7	60	30	62	72	6.12	+2.8	11	10.1	sw.	43	w.	2	16	10	4	4.0	.0	.0	9
Fort Wayne [1]	857	5	33	983.1	1,013.5	----	72.0	+4.6	99	27	84	42	7	60	33	61	70	2.41	−1.2	10	7.8	sw.	33	nw.	23	8	14	8	5.5	.0	.0	9
Detroit [1]	730	5	78	987.5	1,013.5	−1.4	71.5	+5.3	99	28	82	44	7	61	29	60	68	3.26	−.3	12	9.2	nw.	39	nw.	23	6	14	10	5.7	.0	.0	7
Upper Lake Region							64.8	+2.4									76	3.82	+0.4										6.1			
Alpena	609	5	89	990.9	1,013.5	−1.1	62.0	+1.6	97	28	71	42	7	53	37	54	77	2.45	−.8	12	10.1	se.	29	se.	3	6	14	10	6.0	.0	.0	9
Escanaba	612	51	72	990.2	1,012.2	−1.7	61.2	+.5	84	28	69	39	7	53	27	54	79	3.50	+.3	13	9.6	s.	39	n.	17	5	13	12	6.7	.0	.0	11
Grand Rapids [3]	707	70	244	988.2	1,013.5	−1.4	70.6	+2.8	98	27	81	43	7	60	32	60	74	3.73	+.2	12	10.3	sw.	43	sw.	5	11	10	9	5.3	.0	.0	8
Lansing [3]	878	5	90	982.4	1,013.5	----	68.4	+2.0	94	28	79	42	7	58	33	60	72	2.50	−1.0	10	7.6	w.	26	nw.	18	10	11	9	5.2	.0	.0	7
Marquette	734	44	73	985.1	1,012.5	−1.4	60.4	+1.5	93	27	71	39	6	50	37	52	76	4.78	+1.6	15	7.5	ne.	29	sw.	27	4	13	13	6.5	.0	.0	12
Sault Sainte Marie [1]	614	11	52	990.5	1,013.2	−1.4	58.9	+1.4	92	27	70	36	7	47	34	52	80	3.18	+.5	15	10.1	nw.	32	sw.	5	7	6	17	6.8	.0	.0	1
Chicago [1]	673	5	36	988.8	1,013.2	−1.4	72.8	+4.7	100	27	84	45	7	62	30	62	70	3.18	−.3	11	9.3	s.	41	n.	17	8	13	9	5.6	.0	.0	11
Green Bay	617	109	141	989.8	1,012.5	−1.7	67.2	+2.3	92	27	77	42	7	58	33	58	73	5.27	+1.6	14	9.9	s.	33	sw.	5	3	14	13	6.7	.0	.0	9
Milwaukee [1]	681	33	66	988.2	1,012.5	−1.7	67.8	+5.7	95	27	80	43	7	56	35	59	75	3.42	.0	11	11.2	sw.	40	sw.	5	7	14	9	5.7	.0	.0	7
Duluth [3]	1,133	5	47	970.9	1,012.2	−1.0	58.4	+1.2	85	14	68	35	3	48	32	51	80	6.19	+2.3	16	12.0	ne.	38	ne.	3	4	13	13	6.4	.0	.0	7
North Dakota							62.9	−0.1									74	5.48	+1.9										6.4			
Fargo [1]	940	5	43	975.6	1,009.1	−3.4	65.4	+1.0	91	25	77	41	19	54	34	56	75	3.41	−.6	15	12.3	s.	41	s.	2	4	16	10	6.1	T	.0	12
Bismarck	1,679	5	43	949.9	1,009.5	−2.0	63.2	+.3	90	1	74	36	6	53	33	54	74	4.85	+1.5	13	11.6	se.	45	sw.	1	8	9	13	6.2	.0	.0	7
Devils Lake	1,478	11	44	957.3	1,010.2	−1.7	61.8	−.1	88	1	72	36	5	52	35	53	78	5.80	+2.2	15	8.3	ne.	32	nw.	28	7	7	16	6.7	.0	.0	11
Grand Forks [1]	832	4	41	979.7	1,009.8	----	63.6	----	88	1	74	39	8	53	35	55	----	4.18	----	14	----	s.	----	----	----	4	15	11	----	.0	.0	12
Lemmon, S. Dak	2,602	4	38	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Pembina	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Williston	1,878	42	50	944.1	1,010.2	−1.0	61.2	−1.5	91	30	71	39	5	51	31	50	70	7.88	+4.4	13	7.7	se.	28	ne.	17	6	10	14	6.4	.0	.0	7
Upper Mississippi Valley							73.6	+3.4									71	4.64	+0.5										5.5			
Minneapolis-St. Paul [1]	919	43	74	977.7	1,010.5	−2.7	69.7	+2.2	96	25	80	44	6	60	29	60	72	6.69	+2.5	15	11.9	se.	42	w.	4	6	14	10	6.1	.0	.0	9
Springfield, Minn	1,025	4	42	973.9	1,010.5	----	70.4	----	99	25	81	43	5	59	35	59	71	5.20	----	11	----	se.	----	----	----	8	14	8	----	.0	.0	6
La Crosse [1]	714	5	29	985.8	1,011.2	−2.3	69.7	+2.7	89	27	79	47	7	60	29	62	78	4.23	+.2	14	10.0	s.	34	w.	18	7	14	9	5.8	.0	.0	10
Madison [3]	974	70	78	978.0	1,012.9	−1.0	69.6	+2.4	91	27	78	48	6	61	25	62	76	6.38	+2.6	12	7.5	sw.	33	nw.	15	6	14	10	5.9	.0	.0	10
Charles City	1,015	10	51	976.9	1,012.2	−.7	69.9	+3.4	95	25	79	44	6	60	31	----	----	2.85	−1.8	13	7.1	s.	27	se.	11	10	14	6	5.0	.0	.0	12
Davenport	606	6	50	991.2	1,013.2	−.7	73.6	+4.3	95	27	84	46	7	64	27	62	70	6.19	+2.1	10	10.0	s.	47	sw.	14	7	15	8	5.6	.0	.0	9
Des Moines [3]	860	5	99	981.0	1,011.5	−1.7	72.9	+2.3	98	25	82	48	6	64	27	62	73	8.37	+3.6	11	10.6	sw.	29	se.	11	6	14	10	5.8	.0	.0	10
Dubuque	699	81	96	987.5	1,012.5	−1.0	71.8	+2.4	92	27	81	48	6	63	26	62	76	10.87	+6.6	15	5.6	s.	23	nw.	12	5	15	10	6.0	.0	.0	14
Burlington [1]	702	4	56	988.2	1,013.2	−.7	74.8	+3.3	98	17	86	45	6	63	33	63	70	3.38	−1.3	9	10.7	s.	----	----	----	5	15	10	5.8	.0	.0	8
Cairo	359	5	99	1,001.7	1,014.2	−.7	80.2	+2.9	100	22	90	55	7	71	25	----	----	2.04	−1.8	8	6.9	sw.	26	n.	23	9	12	9	5.3	.0	.0	10
Peoria [1]	609	6	26	991.9	1,013.9	−.3	74.2	+4.3	96	27	85	43	7	63	31	64	72	2.72	−1.0	9	9.2	sw.	39	ne.	25	6	19	5	5.5	.0	.0	9
Springfield, Ill. [3]	636	5	191	990.9	1,013.5	−.7	78.3	+6.1	100	27	89	49	7	67	29	63	68	.58	−3.5	5	11.1	s.	37	nw.	18	9	11	10	5.3	.0	.0	9
St. Louis [3]	568	6	303	993.6	1,013.9	−.3	78.9	+3.9	99	17	88	55	7	70	26	62	60	1.34	−2.5	7	11.6	sw.	34	ne.	26	14	15	1	3.9	.0	.0	6
Missouri Valley							73.2	+2.2									71	4.29	−0.1										5.2			
Columbia, Mo. [3]	768	34	96	985.4	1,013 2	−1.0	77.6	+4.1	100	28	88	46	7	67	30	63	68	.83	−3.9	6	7.5	s.	19	nw.	6	14	15	1	4.0	.0	.0	9
Kansas City [1]	993	38	76	978.0	1,011.5	−1.7	77.0	+3.4	97	25	86	50	7	68	26	64	66	3.78	−.9	7	12.5	s.	45	w.	13	9	13	8	5.1	.0	.0	6
St. Joseph [3]	967	11	49	977.3	1,011.2	----	75.0	+1.3	98	25	84	49	7	66	27	64	70	4.43	−.5	10	9.3	s.	41	w.	22	19	6	5	3.7	.0	.0	10
Springfield, Mo. [1]	1,324	5	60	967.5	1,013.5	−.7	74.8	+3.1	94	28	85	46	7	65	27	66	76	2.23	−2.4	10	10.0	s.	34	n.	18	10	12	8	5.1	.0	.0	8
Topeka	987	65	87	976.6	1,011.5	----	77.0	+3.6	99	25	87	51	6	67	26	65	70	3.41	−1.2	10	10.6	s.	27	s.	3	10	12	8	5.1	.0	.0	9
Lincoln [3]	1,189	11	81	968.5	1,010.2	−2.3	73.6	+2.2	99	25	84	46	6	64	33	60	68	6.18	+1.9	16	10.4	s.	34	w.	4	12	7	11	5.6	.0	.0	18
Omaha [1]	1,105	5	68	971.9	1,010.5	−2.4	73.4	+2.7	100	25	82	47	6	64	28	62	70	5.93	+1.4	12	12.8	s.	39	s.	22	7	12	11	5.8	.0	.0	15
Valentine	2,598	46	54	920.1	1,010.2	−1.0	65.2	−1.7	99	25	77	38	6	53	35	53	70	5.70	+2.8	13	9.8	s.	38	sw.	14	14	4	12	5.6	.0	.0	8
Sioux City [1]	1,138	5	40	970.2	1,010.2	−2.3	71.3	+2.5	100	25	82	45	6	61	34	60	72	4.32	+.3	16	11.8	s.	38	s.	3	7	14	9	5.9	.0	.0	14
Huron [1]	1,301	5	41	964.1	1,010.2	−1.3	66.6	+.4	94	25	78	39	6	56	31	58	78	5.14	+1.4	13	12.7	se.	40	sw.	2	8	12	10	5.6	.0	.0	10

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

District and station	Elevation of instruments: Barometer above sea level	Thermometer above ground	Anemometer above ground	Pressure: Station	Sea level	Departure from normal	Temperature of the air: Mean max. + mean min. ÷2	Departure from normal	Maximum	Date	Mean maximum	Minimum	Date	Mean minimum	Greatest daily range	Mean temperature of the dew point	Mean relative humidity	Precipitation: Total	Departure from normal	Days with 0.01 inch or more	Wind: Average hourly velocity	Prevailing direction	Maximum velocity: Miles per hour	Direction	Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Number of days with thunderstorms
	Ft.	*Ft.*	*Ft.*	*Mbs.*	*Mbs.*	*Mbs.*	°*F.*	°*F.*	°*F.*		°*F.*	°*F.*		°*F.*	°*F.*	°*F.*	%	*In.*	*In.*		*Mi.*								*0–10*	*In.*	*In.*	
Northern Slope							**59.9**	**−1.9**									**69**	**3.82**	**+1.6**										**6.4**			
Billings [1]	3,570	16	40	888.6	1,010.8	.....	59.3	−5.6	94	30	69	38	5	49	35	46	70	7.64	.....	17	10.4	n.	35	n.	3	5	10	15	6.8	.0	.0	11
Havre	2,507	11	67	924.1	1,012.2	+1.4	60.3	−1.7	96	30	71	39	4	49	39	48	70	3.68	+.8	15	7.5	ne.	26	sw.	24	3	8	19	7.4	.0	.0	5
Helena [1]	4,124	5	43	871.7	1,012.5	+.6	55.6	−3.6	91	30	67	35	2	44	40	46	72	4.74	+2.7	20	8.4	nw.	27	s.	30	3	12	15	7.2	.0	.0	10
Missoula [2]	3,205	80	91	899.4	1,011.9	.....	60.0	−.1	92	30	72	42	2	48	37	46	68	3.47	+1.6	18	6.4	e.	32	s.	21	5	11	14	6.9	.0	.0	8
Kalispell	2,973	48	56	908.9	1,010.2	−2.0	59.0	+1.3	92	30	70	36	14	48	41	44	64	1.46	−.6	13	5.8	w.	20	nw.	26	5	8	17	6.8	.0	.0	4
Miles City [1]	2,371	5	28	927.5	1,010.8	.0	60.8	.....	92	30	72	37	6	50	34	52	76	9.78	.....	16	.....	nw.	.....	.....	.....	8	5	17	6.6	.0	.0	11
Rapid City [1]	3,259	5	63	898.4	1,010.8	.0	60.8	−3.4	90	26	72	34	6	49	36	51	74	4.97	+1.9	15	13.5	nw.	51	sw.	1	11	9	10	5.2	.0	.0	13
Cheyenne [1]	6,094	5	40	811.0	1,008.8	−1.7	59.5	−.9	90	24	74	37	5	46	41	42	62	1.97	+.4	15	10.6	nw.	48	w.	17	8	13	9	5.5	.0	.0	12
Lander	5,352	60	68	832.4	1,008.8	−2.0	57.8	−2.7	89	30	70	40	18	46	40	40	60	2.02	+.9	12	5.4	sw.	29	sw.	26	11	9	10	5.2	.0	.0	11
Sheridan [1]	3,790	5	38	881.5	1,011.2	.....	57.4	−4.1	89	30	68	35	6	46	37	48	76	9.54	+7.5	16	9.3	nw.	37	e.	9	4	10	16	6.7	.0	.0	12
North Platte [2]	2,821	11	51	912.6	1009.1	−2.1	69.0	+1.5	97	25	80	41	6	58	33	54	67	2.56	−.7	10	8.9	s.	25	sw.	26	7	14	9	5.6	.0	.0	10
Middle Slope							**74.8**	**+2.3**									**63**	**3.40**	**+0.1**										**4.9**			
Denver [2]	5,292	106	113	835.1	1,007.8	−2.7	67.4	+1.1	92	21	80	45	5	55	35	43	53	.81	−.6	7	7.9	s.	24	se.	16	11	15	4	4.6	.0	.0	7
Pueblo [1]	4,690	5	36	853.4	1,007.8	−2.4	69.2	+.6	99	20	85	43	5	53	47	42	48	.34	−1.0	5	9.7	se.	36	sw.	16	12	13	5	4.4	.0	.0	6
Concordia	1,392	50	58	961.7	1,009.8	−2.7	75.1	+2.1	102	22	86	47	6	64	34	62	66	4.10	−.3	11	9.1	s.	36	nw.	21	9	13	8	5.1	.0	.0	14
Dodge City [1]	2,509	5	58	923.5	1,008.5	−3.0	74.8	+2.3	102	20	87	49	5	62	39	60	64	4.53	+1.2	6	16.1	s.	57	n.	30	13	13	4	4.2	.0	.0	10
Wichita [1]	1,358	6	64	963.4	1,010 2	−2.7	78.4	+4.0	101	21	89	54	6	68	30	64	66	1.60	−2.8	6	16.9	s.	56	se.	13	8	15	7	5.7	.0	.0	8
Oklahoma City [2]	1,214	10	47	968.8	1,010.8	−2.1	79.8	+3.8	96	25	89	57	6	70	29	66	69	6.14	+2.5	7	10.5	s.	25	s.	14	14	7	9	4.8	.0	.0	7
Tulsa [1]	674	10	61	988.2	1,011.9	.....	78.7	+2.2	96	25	88	57	6	69	24	68	75	6.29	+1.8	9	12.0	s.	33	n.	14	10	12	8	5.3	.0	.0	12
Southern Slope							**79.5**	**+2.3**									**60**	**2.54**	**0.0**										**4.8**			
Abilene [1]	1,738	4	41	951.2	1,009.8	−2.1	81.6	+4.0	101	21	92	61	7	71	28	66	66	1.28	−1.7	4	15.0	s.	44	n.	5	9	19	2	4.7	.0	.0	4
Amarillo [1]	3,676	5	42	887.2	1,009.1	−1.7	75.5	+4.1	101	21	88	51	5	63	35	57	62	4.33	+1.5	11	15.6	s.	39	ne.	28	13	12	5	4.5	.0	.0	11
Del Rio	990	63	71	977.3	1,009.5	−1.3	83.0	−.4	97	20	92	64	6	74	23	68	66	2.55	.0	6	12.0	se.	32	ne.	6	3	19	8	6.2	.0	.0	3
Roswell	3,566	75	85	889.3	1,007.8	−1.3	77.8	+1.5	102	21	93	51	5	62	41	48	47	1.98	+.3	6	9.6	s.	30	sw.	22	16	11	3	3.6	.0	.0	6
Southern Plateau							**75.3**	**−1.7**									**32**	**0.44**	**+0.1**										**2.2**			
El Paso [1]	3,778	5	85	882.8	1,006.1	−1.4	79.4	+1.4	102	28	93	58	8	66	41	40	32	1.67	+1.1	7	11.2	sw.	42	sw.	25	16	12	2	3.4	.0	.0	6
Albuquerque [1]	5,314	5	48	835.8	1,006.1	.....	73.3	+.7	97	19	87	46	4	59	38	38	34	.85	+.4	6	13.0	s.	49	s.	16	20	7	3	3.3	.0	.0	7
Flagstaff	6,907	36	51	789.7	1,011.9	.....	56.8	−2.7	88	29	74	26	17	39	48	28	38	.10	−.4	1	.....	sw.	.....	.....	.....	24	5	1	.....	.0	.0	1
Phoenix [2]	1,107	39	87	968.8	1,006.1	−1.0	81.2	−3.3	112	29	97	54	17	65	43	40	30	.00	−.1	0	7.1	e.	21	w.	16	24	5	1	1.6	.0	.0	0
Tucson [1]	2,555	6	30	921.1	1,006.4	.....	80.6	−2.0	107	29	97	52	17	64	44	33	21	.04	−.2	1	.....	sw.	.....	.....	.....	21	6	3	2.3	.0	.0	2
Yuma	142	9	54	1002.0	1,006.1	−1.0	80.6	−4.1	113	29	98	54	17	64	46	44	34	.00	.0	0	6.1	w.	22	se.	8	29	1	0	.4	.0	.0	0
Middle Plateau							**61.1**	**−3.9**									**49**	**1.04**	**+0.6**										**4.4**			
Reno [1]	4,527	20	52	859.5	1,010.5	−.7	57.4	−3.7	94	29	75	31	16	40	50	35	52	.18	−.1	3	9.1	nw.	35	w.	2	7	18	5	4.8	T	.0	1
Tonopah	6,090	9	20	811.7	1,009.1	.....	59.4	−6.0	88	30	72	32	16	46	34	28	34	.14	−.1	3	.....	nw.	.....	.....	.....	19	9	2	.....	T	.0	2
Winnemucca	4,339	5	56	864.2	1,009.8	−2.1	58.8	−4.0	96	29	73	34	8	45	44	38	55	2.33	+1.6	9	7.8	sw.	27	sw.	20	9	11	10	5.6	T	.0	4
Modena	5,473	10	46	830.0	1,007.5	−2.3	58.4	−4.9	92	29	76	32	17	41	47	.....	.....	.22	−.1	3	11.6	sw.	53	s.	8	20	6	4	3.0	.0	.0	3
Salt Lake City [1]	4,227	32	58	863.2	1,008.8	−2.0	63.0	−2.7	96	30	76	43	18	50	40	44	56	2.78	+2.0	11	9.7	se.	36	nw.	8	10	13	7	5.2	.0	.0	10
Grand Junction	4,602	60	68	855.7	1,008.1	−2.1	69.5	−1.9	95	30	83	45	3	56	41	34	33	.59	+.2	6	8.6	se.	33	s.	9	18	9	3	3.4	.0	.0	5
Northern Plateau							**61.8**	**−1.6**									**64**	**1.84**	**+0.7**										**5.7**			
Baker [2]	3,471	36	54	892.7	1,011.5	−2.7	56.8	−1.8	88	30	70	36	4	43	41	42	68	2.48	+1.1	15	5.8	n.	20	n.	7	5	15	10	5.8	.0	.0	4
Boise [1]	2,739	5	49	915.7	1,010.2	−2.7	60.8	−3.7	97	30	72	40	8	49	38	45	64	2.04	+1.1	11	9.6	nw.	40	s.	20	8	10	12	5.7	.0	.0	6
Pocatello [1]	4,478	5	31	859.1	1,009.8	−1.7	57.6	−3.9	95	30	71	38	11	44	42	41	63	3.39	+2.3	13	9.3	sw.	40	e.	8	6	12	12	6.0	.0	.0	8
Spokane [1]	1,929	27	42	943.4	1,011.2	−2.7	62.6	−.2	92	29	75	42	14	50	39	44	59	1.11	−.2	9	7.5	ne.	35	ne.	8	5	16	9	6.2	T	.0	6
Walla Walla	991	57	65	976.0	1,011.2	−3.4	66.2	−.3	100	29	77	47	2	55	38	.....	.....	.39	−.7	11	6.5	sw.	2	3 w.	7	8	14	8	5.4	.0	.0	4
Yakima	1,076	58	67	972.9	1,010.8	.....	67.0	+.6	93	29	79	41	2	55	34	.....	.....	1.60	+1.0	4	8.0	nw.	27	nw.	7	10	12	8	5.2	.0	.0	1
North Pacific Coast Region							**59.2**	**−0.6**									**72**	**0.94**	**−0.7**										**6.6**			
North Head	211	5	56	1,009.1	1,016.3	+.7	54.6	−.2	64	9	59	45	2	50	14	50	85	.86	−1.4	8	12.8	n.	36	nw.	7	4	5	21	7.8	.0	.0	0
Seattle [2]	125	90	321	1,010.8	1,015.2	+.7	60.8	−.6	88	9	70	45	2	52	32	48	67	.83	−.5	6	7.9	s.	24	n.	8	7	7	16	6.3	.0	.0	0
Tacoma	194	172	201	1,008.5	1,014.9	−2.0	59.4	+.7	86	10	68	42	2	51	30	.....	.....	.80	−.7	4	8.2	sw.	26	sw.	1	9	7	14	5.9	.0	.0	0
Tatoosh Island	86	9	61	1,013.5	1,016.3	−.3	52.8	−.2	79	9	57	43	2	49	26	48	86	.60	−2.6	7	10.0	w.	36	s.	10	5	9	16	6.8	.0	.0	0
Medford [1]	1,329	29	58	967.2	1,013.9	.....	62.8	−3.0	94	28	76	40	4	50	44	45	61	1.51	+.8	7	.....	nw.	.....	.....	.....	6	7	17	6.2	.0	.0	1
Portland, Oreg. [2]	154	68	106	1,010.2	1,015.2	−2.1	62.6	+.2	89	28	71	46	2	54	34	50	70	.77	−.8	7	6.2	nw	28	sw.	1	5	9	16	6.8	.0	.0	1
Roseburg	510	45	76	997.3	1,015.6	−1.3	61.6	−.9	90	28	72	45	5	51	40	48	66	1.18	+.1	6	4.6	n.	15	n.	7	3	10	17	6.7	.0	.0	1
Middle Pacific Coast Region							**62.5**	**−1.8**									**68**	**1.06**	**+0.6**										**5.6**			
Eureka	60	72	88	1,014.9	1,016.9	+.7	54.6	+.3	61	19	58	46	15	51	12	50	86	1.19	+.5	7	8.1	n.	28	n.	8	0	11	19	7.7	.0	.0	1
Redding [1]	722	20	34	985.8	1,011.2	.....	69.8	−5.3	98	29	80	48	3	59	30	45	48	2.41	+1.6	8	7.8	nw.	37	se.	23	11	8	11	5.4	.0	.0	5
Sacramento	66	92	115	1,009.1	1,011.2	−1.0	67.8	−1.6	101	28	81	46	3	54	41	48	58	.52	+.4	3	8.8	s.	35	nw.	8	16	10	4	3.5	.0	.0	2
San Francisco [2]	155	112	132	1,008.1	1,013.5	−1.1	57.8	−.7	72	8	63	50	14	53	21	50	80	.12	−.1	3	10.6	w.	27	w.	12	8	11	11	5.8	.0	.0	1
South Pacific Coast Region							**66.5**	**−2.5**									**63**	**0.06**	**0.0**										**4.4**			
Fresno [1]	327	5	35	999.0	1,010.5	−.3	72.0	−3.7	105	29	87	49	3	57	38	45	46	.02	−.1	1	8.6	nw.	30	nw.	8	20	9	1	2.6	.0	.0	1
Los Angeles	338	223	250	1,001.4	1,012.9	+.4	63.4	−3.0	85	4	72	50	16	55	29	52	71	.05	.0	3	6.4	w.	20	w.	21	10	15	5	4.7	.0	.0	0
San Diego [1]	87	20	55	1,010.5	1,012.9	−.3	64.2	−.8	76	4	71	54	17	58	22	54	71	.10	.0	3	7.8	w.	17	se.	8	5	17	8	5.8	.0	.0	0
West Indies																																
San Juan, P. R.	82	10	54	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Panama Canal																																
Balboa Heights	118	6	92	.....	[3]1,010.2	−.4	79.7	.0	92	27	86	70	30	74	18	74	[3]88	15.37	+7.0	17	4.8	s.	22	s.	15	0	13	17	7.4	.0	.0	8
Cristobal	27	47	97	.....	[3]1,010.2	.0	81.8	+.3	92	21	87	71	30	76	16	75	[3]82	6.31	−7.5	21	5.7	s.	26	se.	30	0	5	25	8.3	.0	.0	12

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Anemometer above ground	Pressure: Station	Pressure: Sea level	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean temperature of the dew point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Number of days with thunderstorms
Alaska	*Ft.*	*Ft.*	*Mbs.*	*Mbs.*	*Mbs.*	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	%	*In.*	*In.*		*Mi.*							0	-10	*In.*	*In.*	
Anchorage [1]	132	6	44	.....	1,012.5	.....	54.3	+.8	73	17	64	31	3	45	30	44	70	.86	+.2	10	5.9	nw.	27	s.	2	2	10	18	....	.0	.0	1
Fairbanks [1]	455	4	63	.....	1,012.5	.....	58.6	+.2	82	18	72	37	3	46	39	45	66	1.03	−.3	9	7.2	sw.	28	w.	19	1	12	17	7.4	.0	.0	4
Juneau [1]	80	6	21	.....	1,016.6	.....	54.4	....	80	15	64	34	2	45	....	44	74	3.04	....	13	7.1	n.	24	e.	4	7	4	19	....	.0	.0	0
Nome	22	25	56	.....	1,013.9	.....	45.4	−.2	75	22	51	28	2	40	26	40	88	.85	−.3	8	8.1	w.	23	e.	18	0	8	22	8.1	T	.0	0
Bethel	28	7	31	1,012.2	1,013.5	.....	53.2	+.1	71	11	62	35	2	45	29	46	78	.91	−.2	7	8.5	nw.	24	.....	18	3	10	17	7.1	.0	.0	0
Gambell	32	5	32	1,013.5	1,014.6	.....	37.2	−1.3	53	26	41	25	4	33	16	35	93	.57	+.1	9	11.0	sw.	38	ssw.	18	0	3	27	9.0	.0	.0	0
Kotzebue	20	5	31	1,013.5	1,013.9	.....	43.4	−.3	71	22	49	26	6	38	25	40	88	.80	+.4	8	....	w.	....	.....	....	1	7	22	8.2	T	.0	0
McGrath	331	5	31	1,001.0	1,013.5	.....	57.3	.....	79	21	67	39	10	48	31	46	70	2.17	.....	13	....	e.	24	sse.	2	0	11	19	7.9	.0	.0	2
Northway	1,718	5	32	950.9	.....	.....	56.8	.....	82	14	60	32	1	45	37	43	65	2.27	.....	14	6.7	nw.	27	.....	10	1	16	13	6.9	.0	.0	5
Summit	2,405	5	30	929.6	1,016.6	.....	49.8	.....	70	20	50	32	1	41	28	42	76	2.24	.....	9	....	sw.	.....	.....	.....	0	10	20	8.4	.0	.0	0
Hawaiian Islands																															
Honolulu	38	86	100	1,015.9	1,016.6	.....	76.4	−.2	82	7	80	70	7	72	12	.....	.....	.46	−.5	12	9.4	E.	28	E.	1	9	12	9	5.6	.0	.0	0

[1] Data are airport records.
[2] Barometric data (adjusted to old city elevation) and hygrometric data from airport; otherwise city office records.
[3] Observations taken hourly.
[4] Pressure (adjusted to old city elevation) temperature and hygrometric data from airport; otherwise city office records.
[5] Temperature and precipitation from city office records, other data from airport.

NOTE.—Except as indicated by notes 1, 2, 4, and 5 data in table are city office records.

SEVERE LOCAL STORMS, JUNE 1944

[Compiled by Callie E. Rhodes]

[The table herewith contains such data as has been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the United States Meteorological Yearbook]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Dodgeville, Wis., vicinity of.	1	5-7 a. m.	.....	1	.....	Lightning	1 man killed by lightning and 2 others badly shocked.
Barnwell County, S. C.	1	P. m.	.....	1	.....	do	Man killed while working in field.
Rockville, Ind., vicinity of.	1	4:30 p. m.	[1] 1	0	$3,500	Hail	Crop damage, $3,000; property damage, $500.
Ainsworth, Nebr., vicinity of.	2	3 p. m.	[1] 3	0	Unestimated	do	Rye and corn damaged, requiring some replanting of corn.
Bennet and Fullerton, Nebr., vicinity of.	3	2:30-5:45 p. m.	.....	0	$10,500	Wind squall and hail	30 percent loss to crops over a limited area in vicinity of Bennet; value of property destroyed, $500. Near Fullerton corn and small grain damaged; gardens completely ruined; some windows broken and roofs damaged. Property damage estimated at $10,000.
Lakefield, Minn., vicinity of.	3	4:45 p. m.	53	0	$5,000	Thundersquall	Buildings on 2 farms were wrecked; trees uprooted; growing crops slightly damaged.
Minneapolis, St. Paul, Milaca, Morris, Campbell, Wheaton, St. James and vicinity, Minn.	3-4	.....	.....	0	$300,000	Heavy rain	Flooded lowlands, highways, roads, streets and basements; telephone and power lines down; growing crops damaged; losses to merchandise, machinery and other equipment in basements; streetcars burned out by sand and water and from being struck by lighting.
Nicollet, Hennepin, and Ramsey Counties, Minn.	4	P. m.	.....	0	$34,000	Hail	Considerable damage to real property and growing crops.
Between Kimbrae and Heron Lake, Minn.	4	3 p. m.	880	1	$60,000	Thundersqualls	Houses, barns, outbuildings, silos and windmills were demolished or damaged on at least 12 farms; many trees uprooted; a 20,000-bushel grain elevator was wrecked; some livestock and poultry perished. 3 persons were injured, 1 fatally.
Nicollet, Waseca, Hennepin, Ramsey and Washington Counties, Minn.	4	P. m.	.....	0	$80,000	do	Many roofs of buildings and chimneys were damaged; windows broken; poles and wires down; many trees uprooted. 1 person injured.
Fort Wayne, Ind.	5	.....	.....	0	$3,000	Wind	Trees down; some buildings damaged.
Uvalde, Tex., vicinity of.	6	A. m.	[1] 1	0	Unestimated	Tornado	1 person injured. 1 ranch house, several small buildings and windmills damaged.
Warrenton, Va., vicinity of.	6	P. m.	.....	0	$30,000	Electrical	Chicken hatchery damaged and chickens killed.
Haigler, Nebr., vicinity of.	7	4-6 p. m.	[1] 10	0	$20,000	Hail and heavy rain	Damage to crops estimated at $20,000, besides some damage to trees and small buildings.
Scotts Bluff and Morrill Counties, Nebr.	7	3-5 p. m., C. W. T.	[1] 2-3	0	$35,000	Hailstorm	Storm moved from northwest to southeast. Alfalfa, sugar beets, barley and other small grains damaged; beans and corn required replanting in places.
Chaves, Curry and Roosevelt Counties, N. Mex.	10	P. m.	[1] 1-7	0	$27,500	Wind and hail	Damage from heavy hail considerable at Melrose and Hagerman; damage from wind and hail at Roswell estimated at $2,500, and from hail at Portales estimated at $25,000.
Lake, Blaine, Fergus, Carbon, Valley Counties, Mont.	11	5-11 p. m.	[1] ½-4	0	$27,000	Hail and rain	Winter wheat, alfalfa, gardens and fruit damaged. In Valley County loss in wheat, beets and alfalfa 30 to 75 percent.
Putnamville, Ind., vicinity of.	12	P. m.	.....	0	$1,500	Wind	Buildings damaged; trees down.

[1] Miles instead of yards.

SEVERE LOCAL STORMS, JUNE 1944—Continued

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Eastern Scotts Bluff and western Morrill Counties, Nebr.	12	3:30–5 p. m., C. W. T.	[1] 1–4	0	$40,000	Hailstorm	Principal loss to alfalfa, sugar beets, and small grains. Some alfalfa 18 inches high reduced to stubble 3 inches high. This was the second hailstorm in approximately the same area, the first occurring on June 7.
Fallon and Chouteau Counties, Mont.	12	1–7 p. m.		0	Unestimated	Hail	Damage to gardens and grain estimated at $2,000 in Fallon County; damage to wheat in Chouteau County up to 100 percent.
Hazel Green, Wis.	12	5 p. m.		1		Lightning	17-year old girl killed by lightning near Hazel Green, Grant County.
Lamar, S. C.	13	Night		0	$45,000	do	Warehouse and 349 bales of cotton burned; also residence struck and burned.
Syracuse, Nebr., vicinity of.	13	10 p. m.	[1] 4	0	$100,000	Wind and hail	Complete loss of wheat and oats in hail area.
San Jon Valley and Tucumcari, N. Mex.	14	Noon to 10 p. m.	[1] 3–4	0	$55,000	Hail	Poultry killed and wheat crops damaged.
Terre Haute, Ind.	14			0	$1,000	Wind	Trees and wires down; some plate glass broken.
Judith, Basin, Fergus, and Rosebud Counties, Mont.	14	P. m.	[1] 1–2	0	$4,500	Hail	Gardens and winter wheat damaged.
Yellowstone County, Mont.	14–16	P. m.	[1] 1–3	0	$61,000	Hail and rain	A series of storms occurred in the Huntley, Billings, and Shepherd area, damaging 1,000 acres of beets, 300 acres of truck crops, 5,000 acres of beans, peas, alfalfa, and grains; estimated loss $60,000. Loss from broken windows and poultry estimated at $1,000.
Milwaukee, Wis., vicinity of.	15	9:00–10:00 p. m.		0	$38,000	Thundersquall	30 people injured at Borchert Field; nearby houses and utility wires damaged; windows broken. Property damage $25,500. In southern Door County a barn, granary, machine shed, 2 silos destroyed and other buildings damaged. Estimated property damage, $10,000; estimated damage to cherry and apple trees, $2,500.
Le Center, Minn., and vicinity.	15			0	$20,000	Heavy rain	Heavy to excessive rains that accompanied a severe thunderstorm flooded lowlands and damaged growing crops.
Musselshell and Wheatland Counties, Mont.	15	7–9 p. m.	[1] ¼–10	0	$38,000	Hail	Damage to wheat and alfalfa.
Albion, N. Y., vicinity of.	16			0	Unestimated	Hailstorm	Tree-fruit damaged.
Peru, N. Y., vicinity of.	16		[1] ½	0	do	do	Apples damaged.
Onondaga County, N. Y.	16			0	$20,000	Thunderstorm	Underpasses and cellars flooded in Syracuse, power and communication lines broken, and trees blown down. Near North Syracuse 2 barns were fired by lightning.
Lincoln, Turner, and Union Counties, S. Dak.	16	4–5 p. m.		0	$250,000	Wind	Numerous farm buildings, church, windmills, and farm machinery wrecked; great number of stock and poultry killed; several people injured.
Stillwater, Gallatin, Golden Valley, Dawson, McCone, and Prairie Counties, Mont.	16	3 p. m.–midnight	[1] ¼–10	0	$340,500 or over.	Hail, wind, and rain	In Dawson and McCone Counties all crops damaged; estimate $250,000; damage to property estimated at $80,000. In other counties damage was to gardens, beans, alfalfa, beets, wheat, and other small grain crops.
Dawson County, Mont.	16–17			2	Unestimated	Torrential rain, hail, and tornadic wind.	At Intake the wind reached almost tornadic proportions and damaged every building in the town. Grain bins were smashed and every home more or less flooded. In the Retah and Bloomfield district hail leveled most of the crops and many barns and buildings were damaged by wind or flood; some sheep and livestock lost. Two small children drowned on Burns Creek as the trailer house in which the family lived floated from its location.
Beadle, Faulk, Brown, Codington, Day, Grant, and Roberts Counties, S. Dak.	17	5–6 p. m.		13	do	Wind	Residences, farm buildings, farm machinery, power and telephone lines wrecked; trees uprooted; great number of stock and poultry killed. 13 people killed and more than 50 injured. Damage estimated at several hundred thousand dollars.
Milwaukee, and Rock, Walworth, and Racine Counties, Wis.	17	3:00–5:30 a.m.		0	$12,000	Thunderstorms	Utility service interrupted in whole area; highways blocked by fallen trees in the Racine area, and light and power poles broken. At Sturtevant Airport, Racine, 3 airplanes damaged; a large barn blown down in the Racine area, and several silos blown down in the Burlington area. In Walworth County, many prime cherry trees loaded with a bumper crop were broken down.
Dexter, Minn., and vicinity.	17	1:30 a.m., CWT	[1] 3	0	$45,000	Thundersqualls	3 barns and several silos demolished; poles and wires down; many trees uprooted; growing crops damaged.
Minneapolis, St. Paul, Minn., and vicinity.	17	P.m.		0	$5,000	do	Buildings were damaged, windows broken, poles and wires down, and trees uprooted.
Beardsley and Graceville, Minn., vicinities of.	17	6:30 p.m. CWT		0	$250,000	Tornado	Many farm buildings wrecked or damaged; poles and wires down; some livestock and poultry killed; growing crops damaged; four persons injured.
Trempealeau, Jackson, Wood, Portage, and Winnebago Counties, Wis.	18	P.m.		0	$100,000	Hailstorms	Damage greatest in Wood and Portage Counties, where the stones were reported up to the size of baseballs and softballs. At Stevens Point 3 greenhouses and 2,500 panes of glass broken. Many windows in schools, churches, and homes broken, roofs riddled, automobiles dented, crops and shrubbery beaten down, and fruit beaten off trees. Total property damage estimated at $25,000 and crop damage at $75,000.
Juneau, Outagamie, Trempealeau, Jackson, Wood, Portage, Waupaca, and Winnebago Counties, Wis.	18	P.m.		2	$186,000	Windstorms	Damage was greatest in Wood and Portage Counties. At Stevens Point, scarcely a house escaped some damage, mostly to roofs and windows; many streets blocked by fallen trees and live wires. Considerable damage occurred in Winnebago County, largely to farm buildings. Two persons were drowned on Lake Winnebago when their motorboats capsized; 12 persons injured. At least 4 houses, 25 barns, and many smaller buildings were destroyed or severely damaged; several livestock killed. Property damage estimated at $136,000, crop damage $50,000.
West-central Portage County, Wis.	18		[1] ¾	0	$105,000	Tornado	3 houses, 20 barns, many smaller buildings, and farm machinery were wrecked; many other buildings damaged; several domestic animals killed. Property damage estimated at $100,000, and crop damage at $5,000.
Onondaga County, N. Y.	19		[1] ½	0	$50,000	Thunderstorm and hail.	A thunderstorm, accompanied by hail, caused damage to field crops estimated at $50,000.

[1] Miles instead of yards.

SEVERE LOCAL STORMS, JUNE 1944—Continued

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
The East	19	Night		1		Heavy thunderstorm	1 person killed by lightning near Port Jefferson, N. Y. Many points struck by lightning in New Jersey. A huge oil tank at Linden set on fire; telephone and railroad signal lines were down at many points. Farm crops and gardens injured by rain. Damage estimated at thousands of dollars was sustained in the Washington area. In an earlier storm 10 cows at the Department of Agriculture, Beltsville Research Center, Maryland, had been killed by lightning.
Marlboro County, S. C.	19	8:30 p.m.		0	$15,000	Hail	Damage to crops, estimated at $15,000.
Fergus County, Mont.	19	6:00 p.m.	[1] ¼–2	0	$5,250	do	Damage to gardens and wheat.
Amelia, Va., vicinity of	19	5:00 p.m.		0	$10,000	do	Damage to tobacco.
Midland, Va., vicinity of	19	8:00 p.m.	[1] 2	0	$10,400	do	Damage to crops estimated at $8,400; damage to property, $2,000.
Virginia, southern and southwestern portions.	19	1:00–4:00 p. m.	[1] 1–10	0	$54,200	Hail and wind	Damage to corn, small grain, tobacco, and fruit vicinity of Chatham estimated at $20,000; damage to corn, tobacco, buildings near Halifax, $4,200; damage to crops and property near Hillsville, $30,000.
Winchester, Va., vicinity of.	19	8:30–10:30 a. m.	900–1,320	0	$585,000	Hailstorms and wind	$510,000 damage to fruit crops; $50,000 damage to trees; $25,000 damage to property.
Chouteau and Wibaux Counties, Mont.	20	2:00 p. m.	[1] 3	0	$15,000	Hail	Damage to wheat and barley.
Powder River, Ravalli, and Silver Bow Counties, Mont.	21	3:00–7:00 p. m.	[1] 3–10	0		do	Damage to grains, potatoes, and gardens in Powder River County considerable. Damage to apples in Ravalli County estimated at $500. Damage to real property in Silver Bow County estimated at $10,000.
Southern half of Pawnee County, Nebr.	21	7:30 p. m., CWT	[1] 1–4	0	Unestimated	Heavy hail, and a small probable tornado.	Winter wheat and gardens severely damaged in affected area; many windows were broken, a barn and some small buildings were destroyed. The crop damage was so great it is impossible to estimate.
Grant and Lafayette Counties, Wis.	22	6:30 p. m.	[1] 1	7	$1,023,000	Tornado	6 people killed at or near Belmont and 1 near Gratiot; 75 people injured, mostly in the Belmont area; 25 homes, 61 barns, 3 cheese factories, and many smaller buildings destroyed; many livestock killed. Property damage estimated at $1,000,000, crop damage at $23,000.
Wood County, Wis.	22	9:30 p. m.	[1] ½	0	$40,000	do	Five barns destroyed and several others damaged; many homes damaged. A cow and 100 chickens killed; utility service disrupted. Property damage estimated at $15,000, and crop damage at $25,000.
Grant and Lafayette Counties, Wis.	22	7:30 p. m.	[1] ¼–2	0	$8,000	Hailstorm	Damage to crops estimated at $8,000; damage to buildings slight.
Minnesota, southeastern portion.	22	3:30 p. m.–12 midnight	[1] 7	0	$3,176,000	Thundersquall (possibly tornado) and hail.	Much damage from hail to neon signs, windows, roofs, sidings, and automobile tops; 10 airplanes were damaged; growing crops damaged severely; several thousand chickens were killed; some hogs perished. More than 60 barns, outbuildings, silos, and windmills demolished by a small tornado; poles and wires down; growing crops damaged; some livestock killed; 2 people injured.
Belmont, Wis., vicinity of.	22	Night	[1] 3	9		Tornado	The tornado struck two border counties in Wisconsin and Illinois. 6 persons killed in Lafayette County, Wis., and 3 in Stephenson County, Ill., and an unknown number injured. Damage to property was estimated at thousands of dollars, with estimates of more than 100 homes and farm buildings leveled; heavy losses in livestock.
Big Horn County, Mont.	23	7:00 p. m.	[1] 6	0	$10,000	Hail	Damage to crops.
Greene, Hawkins and Washington Counties, Tenn.	23	8:00–9:00 p. m.		0	Unestimated	Tornado	13 homes and 60 other buildings destroyed, 27 homes and 90 other buildings damaged. 3 persons injured.
Fredonia, Pa., vicinity of.	23	5:20 p. m.	100	0	$10,000–$15,000	Windstorm	A few buildings destroyed or damaged a few miles east of Fredonia, Pa. 1 person injured.
Gate City, Va., vicinity of.	23	6:00 p. m.		0	$3,000	Wind and hail	Damage to corn, tobacco, and gardens.
Southwestern Pennsylvania, northern West Virginia, Eastern Shore, and Garret County in western Maryland.	23	Night	166–333	159	$5,000,000	Tornadoes, series of	The tornadoes moved from northwest to southeast in nearly parallel paths. There were 4 main paths of destruction and 1 intermediate one. Of the 159 lives lost, 4 were in Maryland, 45 in Pennsylvania, and 110 in West Virginia. More than 1,000 persons injured throughout the stricken area. At McKeesport, Pa., 110 houses leveled; two 355-foot transmitter towers of radio station WCAE at Pittsburgh blown down. Many workers injured when sections of roof of steel mills at McKeesport were blown off; more than 50 persons injured at Waynesboro, Pa. The small town of Chartiers, Pa., was virtually wiped out; 58 killed and 100 injured at Shinnston, W. Va., which was the hardest hit point. The storm took its heaviest Pennsylvania toll around Chartiers and Clarksville, 40 miles south of Pittsburgh, and at communities within 20 miles of Pittsburgh. Dwellings, farm buildings, and other structures demolished; streets and highways littered with wreckage; communication lines cut. The storm hit Maryland on the Eastern Shore and in Garret County in the west portion. Property damage in Maryland alone about $1,000,000.
Dickeyville, Wis., vicinity of.	26	Noon		0	$5,500	Thunderstorm	A farmhouse, barn, and silo destroyed; several hundred chickens killed; communication lines disrupted; crops beaten down.
Hector, Minn., vicinity of.	26	5:00 p. m.	[1] 3	0	$25,000	Thundersquall	Several farm buildings were damaged; two hangars were demolished at the airport, which caused loss of one airplane and damage to another.
Coahoma, Howard County, Tex.	28	P. m.	[1] 2	0		Hail and wind	Cotton in the storm area was damaged 60% to 70%. Accompanying wind damaged many small farm buildings.
Spartanburg, S. C., vicinity of.	30	4:00–6:00 p. m.	[1] ½	0	$10,000	Hail	Damage to crops.
Chouteau County, Mont.	30	7:00 p. m.	[1] 2	0	$5,000	do	Damage to wheat, oats, and barley.

[1] Miles instead of yards.

SOLAR RADIATION AND SUNSPOT DATA FOR JUNE 1944

[Solar Radiation Investigations Section, I. F. Hand, in charge.]

SOLAR RADIATION OBSERVATIONS

EXPLANATIONS of the tables and references to descriptions of instruments, stations, and methods of observation, and to summaries of data, are given in the January 1944 REVIEW, page 43. A list of the pyrheliometric stations also is given on page 45 of the same REVIEW.

TABLE 1.—*Solar radiation intensities during June 1944*

[Gram-calories per minute per square centimeter of normal surface]

MADISON, WIS.

Date	Sun's zenith distance: 7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	1:30 p. m.
	75th mer. time	Air mass: A. M.					P. M.				Local mean solar time
	e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e
	mb.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mb.*
June 2	25.0	0.71	0.76	0.90	1.02	1.14					25.0
June 3	23.4	.39	.48	.60							23.4
June 5	19.0	.50	.64	.75	.83						14.8
June 7	10.6		.45	.58	.76	1.16					9.4
June 14	21.8	.58	.69	.84	.96						25.0
June 16	19.0	.65	.71								26.8
June 20	12.7	.68	.77	.86	1.02	1.26					14.8
June 21	14.2					1.20					17.7
June 23	25.0			.52							19.6
June 24	17.7	.49	.66	.79	.98	1.24					21.1
June 27	26.8			.71	.94	1.21					22.6
June 28	24.2		.45	.64	.86	1.20					24.2
June 29	14.2	.62	.74	.83	1.03	1.46					14.8
June 30	14.2					1.55					11.4
Means		.58	.64	.73	.93	1.27					
Departures		−.08	−.16	−.20	−.12	−.06					

LINCOLN, NEBR.

June 6	8.7					1.38	1.10	0.92	0.79	0.71	8.1
June 13	19.0					1.37	1.17	1.01	.90	.82	20.4
June 14	19.0					1.22	1.03	.88	.75	.67	17.7
June 15	25.9					1.33	1.06	.84			24.2
June 17	24.2					1.37	.92	.77	.62		22.6
June 19	11.8					1.35	1.03	.86	.71		10.6
June 23	23.4					1.35	1.14	.99	.88	.79	18.3
June 24	16.4					1.33	1.10				14.2
June 25	25.0					1.31					25.0
June 27	20.4					1.31					16.4
Means						1.33	1.07	.90	.78	.75	
Departures						−.03	−.03	−.01	.00	+.08	

*Extrapolated.

TABLE 1.—*Solar radiation intensities during June 1944*—Continued

BLUE HILL, MASS.

Date	Sun's zenith distance: 7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	1:30 p. m.
	75th mer. time	Air mass: A. M.					P. M.				Local mean solar time
	e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e
	mb.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mb.*
June 2	15.9						0.89				11.8
June 4	6.6	0.79	0.88			1.45	1.21				5.3
June 5	7.2	.71	.81	0.92				0.91	0.83	0.59	7.8
June 6	15.3	.47	.59	.72	0.93						15.9
June 8	8.7	.81	.91	1.04	1.21						8.4
June 9	11.8	.56	.69	.89							10.2
June 11	13.2						1.02	.79	.63	.51	14.7
June 12	13.7						.86	.62	.48	.38	14.2
June 13	11.8	.66	.76	.87	1.11		1.14	.92	.84	.77	8.7
June 18	18.3	.67	.80	.93							17.6
June 23	17.0	.32	.46	.56	.76						19.6
June 27	18.3	.46	.60	.72	.90						18.3
June 29	21.8	.30	.40	.52	.74						27.7
Means		.58	.69	.80	.94	1.45	1.02	.81	.70	.56	
Departures		−.07	−.07	−.09	−.10	+.15	−.03	−.04	+.05	+.02	

ALBUQUERQUE, N. MEX.

June 3	7.4	0.92	0.99	1.09	1.26	1.49					4.8
June 4	6.3			1.05	1.21						8.0
June 6	11.8			.93							11.3
June 8	7.7			1.08	1.44						7.7
June 10	9.4						1.12				8.4
June 11	11.3				1.14		1.21				5.3
June 12	5.6		.94	1.08	1.21	1.44					6.1
June 13	6.6	.78	.86	.99	1.15						7.2
June 14	5.8	.85	.94	1.07	1.22						8.4
June 15	6.6		1.04	1.14							9.0
June 17	5.8		1.04	1.14	1.30		1.22	1.08			8.7
June 18	4.8				1.17	1.48	1.38	1.31	1.21	1.18	8.0
June 19	9.7			1.00	1.16	1.43	1.08	.91	.75	.69	10.5
June 20	9.7		.91	1.04	1.17	1.42					8.7
June 24	13.6				1.05	1.39	1.16	1.02	.88	.82	7.4
June 26	16.9						1.26	1.13	1.04	.98	8.4
June 27	6.1				1.24	1.49	1.24	1.10	.90	.92	5.8
June 28	5.8	.88	.96	1.09	1.26	1.48	1.21	1.11			4.6
June 29	11.8				.98	1.43	1.24				13.1
Means		.86	.96	1.06	1.20	1.45	1.21	1.09	.97	.92	
Departures		−.02	+.01	.00	−.01	.00	−.01	.00	+.01	+.03	

*Extrapolated.

TABLE 2.—*Daily totals and weekly means of solar radiation (direct+diffuse) received on a horizontal surface*

[Gram-calories per square centimeter]

Date	Washington, D. C.	Madison, Wis.	Lincoln, Nebr.	New York, N. Y.	Fresno, Calif.	Fairbanks, Alaska	Columbia, Mo.	Boston, Mass.	Nashville, Tenn.	La Jolla, Calif.	Riverside, Calif.	Blue Hill, Mass.	Ithaca, N. Y.	Newport, R. I.	State College, Pa.	Put-in-Bay, Ohio	East Wareham, Mass.	Davis, Calif.	Boulder, Colo.
1944	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.
June 3	651	664	484	605	747	541	.....	409	430	532	.....	407	230	558	697	509	438	809	598
June 4	235	636	459	668	748	549	.....	704	613	715	700	770	.....	801	64	597	779	800	373
June 5	400	419	678	645	719	578	.....	645	574	681	698	731	692	769	318	642	748	764	431
June 6	588	323	774	580	727	543	.....	654	622	530	712	698	340	645	494	442	728	753	506
June 7	567	614	65	627	726	412	.....	412	745	493	483	418	248	397	416	755	.....	796	442
June 8	706	194	74	686	710	423	.....	738	725	122	165	737	474	768	659	463	747	815	349
June 9	435	62	129	547	739	558	.....	674	554	461	237	638	540	698	591	206	675	686	567
Mean	**512**	**416**	**380**	**623**	**731**	**515**	.....	**605**	**609**	**505**	**499**	**628**	**424**	**662**	**462**	**516**	**654**	**775**	**469**
Departure	**+2**	**−92**	**−136**	**+125**	**+54**	**+11**	.....	.....	**+58**	**−25**	**−34**	**+93**	**−92**	**+89**	**−10**	**−26**	**+82**	**+63**	.....
June 10	259	172	161	97	729	632	.....	164	537	603	375	168	117	230	418	215	246	729	524
June 11	593	276	476	650	735	519	.....	431	633	490	488	292	670	271	764	701	272	756	287
June 12	625	438	460	631	740	606	.....	676	598	174	464	614	524	485	630	657	551	708	572
June 13	597	383	739	566	757	604	.....	782	455	390	543	756	550	736	587	288	741	775	537
June 14	76	628	630	223	662	423	.....	661	445	577	645	555	101	479	48	690	553	821	543
June 15	144	679	712	79	427	404	.....	145	524	604	673	121	473	179	335	660	183	463	703
June 16	633	655	720	561	706	588	641	554	685	692	546	570	561	575	586	702	563	789	647
Mean	**418**	**462**	**557**	**401**	**679**	**539**	.....	**488**	**554**	**504**	**533**	**440**	**428**	**422**	**481**	**559**	**444**	**733**	**545**
Departure	**−82**	**−42**	**+21**	**−83**	**−14**	**+27**	.....	.....	**−1**	**−36**	**−30**	**−42**	**−65**	**−66**	**−9**	**−24**	**−86**	**−15**	.....
June 17	616	472	732	633	756	594	734	502	656	714	713	573	467	635	642	587	476	700	745
June 18	573	409	728	608	750	616	574	727	585	728	727	674	436	586	531	637	588	797	752
June 19	280	268	765	202	745	444	784	130	643	754	732	154	378	255	419	464	168	796	745
June 20	538	711	332	332	736	538	269	14	621	691	713	98	166	116	211	520	115	803	751
June 21	540	579	475	182	606	.....	520	78	647	680	648	101	285	116	392	737	184	652	588
June 22	416	360	544	645	707	.....	736	553	614	.....	697	486	635	634	524	430	538	752	738
June 23	332	633	756	206	651	.....	596	456	689	.....	542	470	320	524	279	578	517	541	721
Mean	**471**	**490**	**619**	**401**	**707**	**548**	**602**	**352**	**637**	**713**	**682**	**365**	**384**	**409**	**428**	**564**	**369**	**720**	**720**
Departure	**−31**	**−46**	**+41**	**−92**	**−9**	**+6**	.....	.....	**+65**	**+98**	**+72**	**−170**	**−120**	**−147**	**−95**	**−54**	**−130**	**−30**	.....
June 24	359	739	732	284	742	467	761	46	644	741	689	43	129	87	135	743	127	725	597
June 25	508	695	731	231	606	590	700	38	723	537	686	91	460	134	426	667	103	739	542
June 26	644	484	493	695	728	(473)	709	214	631	652	571	314	750	318	646	653	273	757	512
June 27	612	692	704	455	716	201	718	653	644	544	675	637	569	608	655	690	640	802	737
June 28	486	705	381	512	703	586	621	622	498	336	633	611	538	612	628	619	614	788	399
June 29	616	671	238	434	716	496	491	624	473	225	657	618	382	566	534	720	593	793	622
June 30	545	729	466	554	707	512	688	442	630	263	667	451	610	432	610	574	439	807	620
July 1	698	730	693	741	700	492	687	707	662	492	704	738	694	734	762	752	748	798	693
Mean	**558**	**681**	**555**	**488**	**702**	**477**	**670**	**418**	**613**	**474**	**660**	**438**	**516**	**444**	**550**	**677**	**442**	**776**	**590**
Departure	**+27**	**+140**	**−32**	**+1**	**+2**	**+13**	**672**	.....	**+63**	**−86**	**+67**	**−59**	**+27**	**−106**	**+36**	**+67**	**−51**	**+4**	.....

ACCUMULATED DEPARTURES ON JULY 1, 1944

	−3,046	**−3,731**	**−9,475**	**−5,193**	**+2,382**	.....	.....	.....	**+931**	**−2,767**	.....	**+1,012**	.....	**−2,122**	**−202**	**−206**	**+936**	**+837**	.....

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR JUNE 1944

By LUCY T. DAY

[Equatorial Division, U. S. Naval Observatory]

[Communicated by Capt. J. F. Hellweg, U. S. N. (Ret.) Superintendent, U. S. Naval Observatory.] All measurements and spot counts were made at the Naval Observatory from plates taken at the observatories indicated. Difference in longitude is measured from the central meridian, positive toward the west. Latitude is positive toward the north. Areas are corrected for foreshortening and expressed in millionths of Sun's hemisphere. For each day, under longitude, latitude, area of spot or group, and spot count are included assumed longitude of center of the disk, assumed latitude of center of the disk, total area of spots and groups and total spot count.

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1944	h m		°	°	°	°				
June 1	10 56	7642	+75	197	+1	75	109	1	F	U. S. Naval.
		7642	+80	202	0	80	194	3		
				(122)	(−1)		303	4		
2	11 16	.....	.....	No spots		.....	.....	.....	G	Do.
3	10 43	.....	.....	No spots		.....	.....	.....	G	Do.
†4	.....	.....	.....	No spots		.....	.....	.....	.....	Mt. Wilson.
5	14 6	.....	.....	No spots		.....	.....	.....	F	U. S. Naval.
6	10 31	.....	.....	No spots		.....	.....	.....	G	Do.
7	12 8	.....	.....	No spots		.....	.....	.....	G	Do.
8	11 4	7643	−35	355	−29	44	24	2	G	Do.
				(30)	(0)		24	2		
9	10 54	.....	.....	No spots		.....	.....	.....	G	Do.
10	11 0	7643	−14	349	−29	33	24	2	G	Mt. Wilson.
				(3)	(+1)		24	2		
11	9 27	7643	−3	348	−28	30	36	6	G	Do.
				(351)	(+1)		36	6		
12	10 44	.....	.....	No spots			.....	.....	F	U. S. Naval.
13	11 27	.....	.....	No spots			.....	.....	G	Do.
†14	20 0	7644	−19	286	+37	41	18	2	.....	Mt. Wilson.
		7643	+45	350	−29	53	12	2	.....	
				(305)	(+1)		30	4		
16	11 8	7645	−80	204	+1	80	194	3	G	U. S. Naval.
				(284)	(+1)		194	3		

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR JUNE 1944—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1944	h m		°	°	°	°				
June 17	10 38	7645	−66	205	+2	66	145	1	F	U. S. Naval.
				(271)	(+1)		145	1		
18	10 46	7645	−53	204	+2	53	73	1	F	Do.
				(257)	(+1)		73	1		
19	12 13	7645	−39	204	+2	39	73	1	F	Do.
				(243)	(+2)		73	1		
20	11 40	7645	−25	205	+2	25	73	1	G	Do.
				(230)	(+2)		73	1		
21	10 53	7645	−12	206	+1	12	73	1	G	Do.
				(218)	(+2)		73	1		
22	14 32	7645	+3	205	+1	3	61	1	G	Do.
				(202)	(+2)		61	1		
23	12 25	7645	+16	206	+1	16	61	1		Do.
				(190)	(+2)		61	1	P	
24	10 54	7645	+29	207	+1	29	61	1	G	Do.
				(178)	(+2)		61	1		
25	10 37	7645	+42	207	+1	42	61	1	F	Do.
				(165)	(+2)		61	1		
26	10 41	7645	+55	207	+1	55	48	1	F	Do.
				(152)	(+2)		48	1		
27	10 36	7645	+68	206	+1	68	48	1	G	Do.
				(138)	(+2)		48	1		
28	11 28	7645	+81	206	+1	81	48	1	F	Do.
				(125)	(+3)		48	1		
29	11 6	.....	.....	No spots		.....	.....	.....	F	Do.
30	11 18	.....	.....	No spots		.....	.....	.....	F	Do.

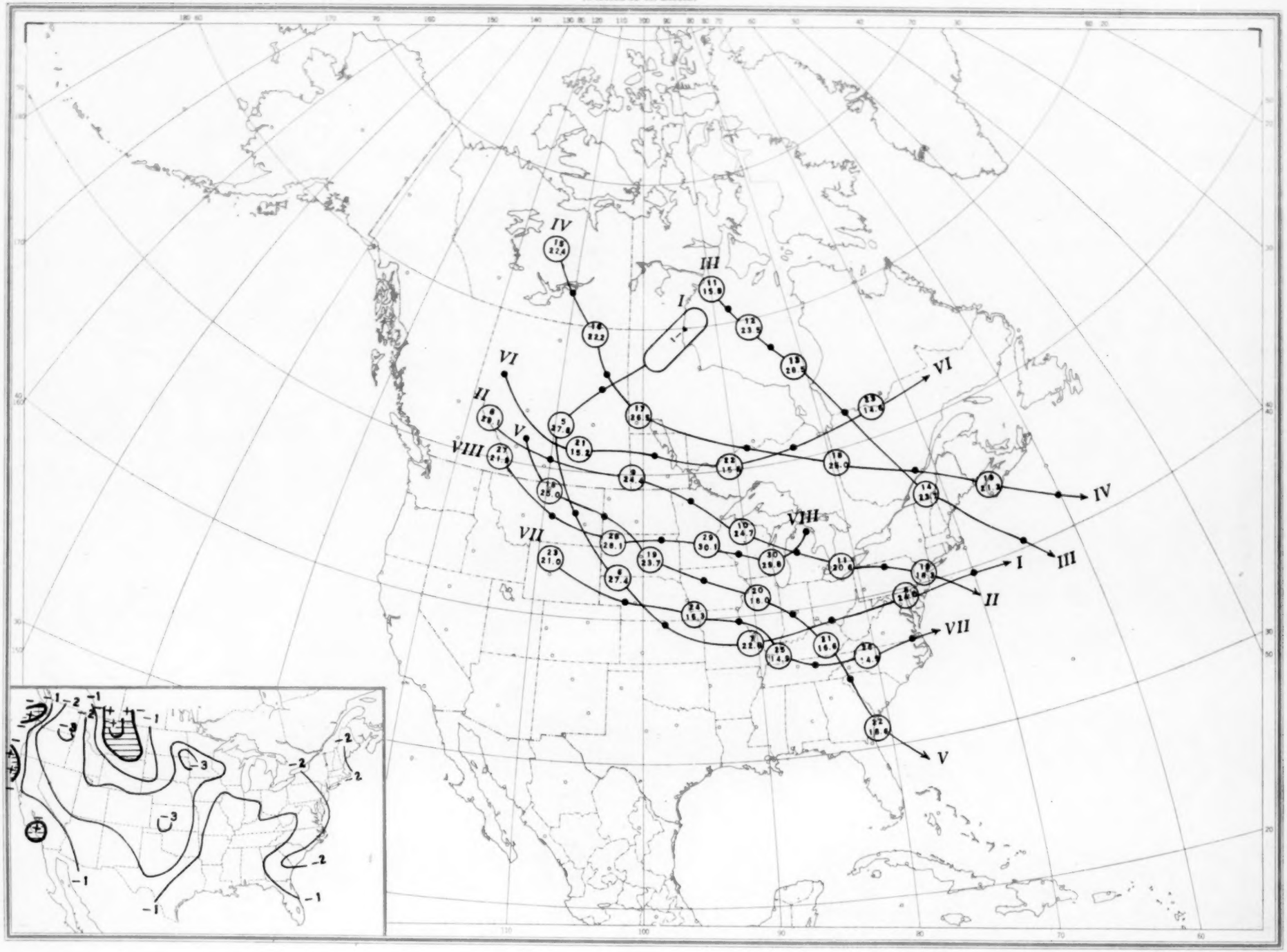
Mean daily area for 29 days=50

† Data taken from Mount Wilson charts.
VG=very good; G=good; F=fair; P=poor.

Chart I. Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, June 1944

Chart II. Tracks of Centers of Anticyclones, June 1944. (Inset) Departure of Monthly Mean Pressure from Normal

(Plotted by A. Bloom)



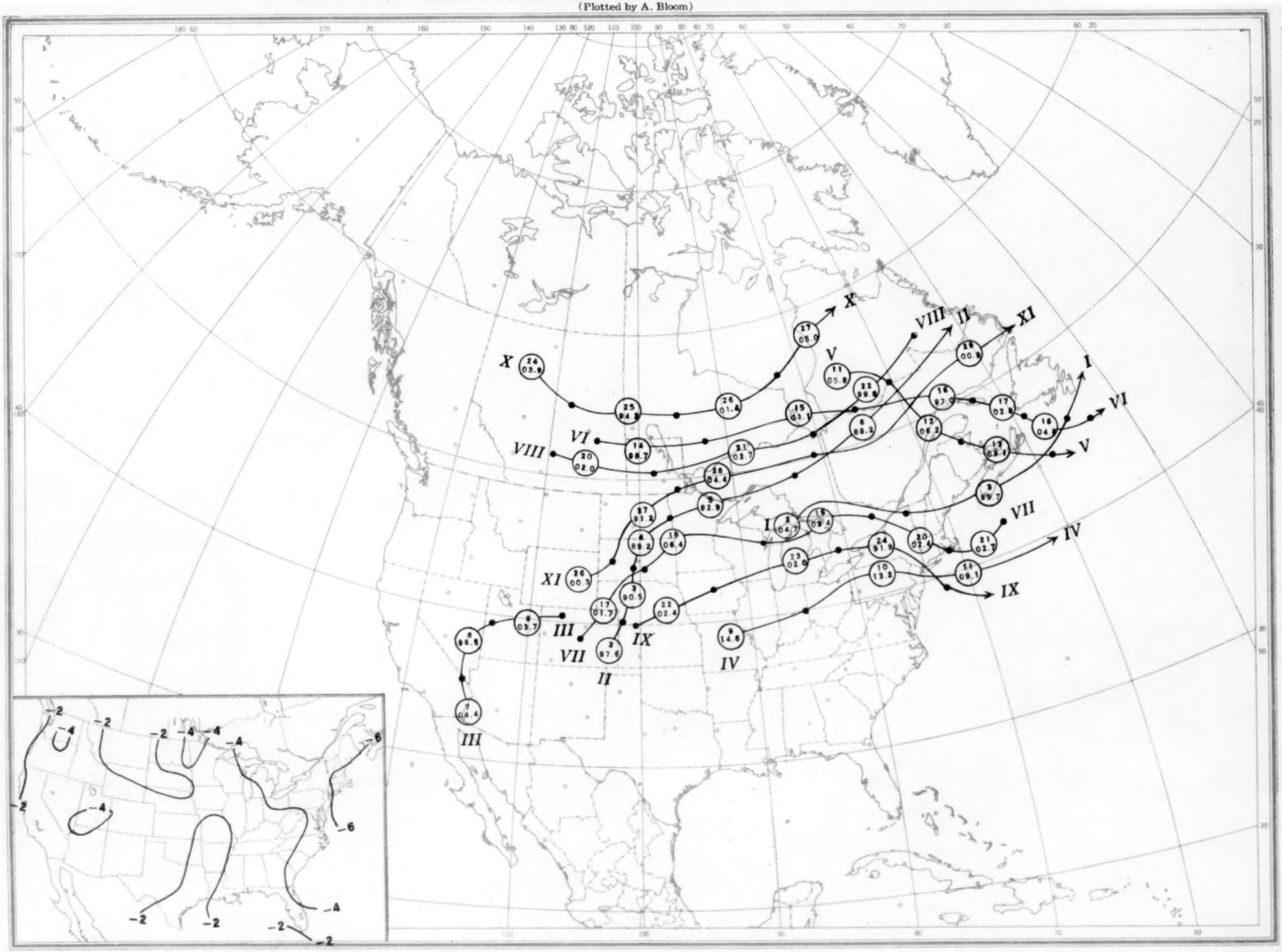
Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time)

Chart III. Tracks of Centers of Cyclones, June 1944. (Inset) Change in Mean Pressure from Preceding Month

Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time)

Chart III. Tracks of Centers of Cyclones, June 1944. (Inset) Change in Mean Pressure from Preceding Month

(Plotted by A. Bloom)



Circle indicates position of cyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of cyclone at 7:30 p. m. (75th meridian time)

Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, June 1944

Chart V. Total Precipitation, Inches, June 1944. (Inset) Departure of Precipitation from Normal

Chart V. Total Precipitation, Inches, June 1944. (Inset) Departure of Precipitation from Normal

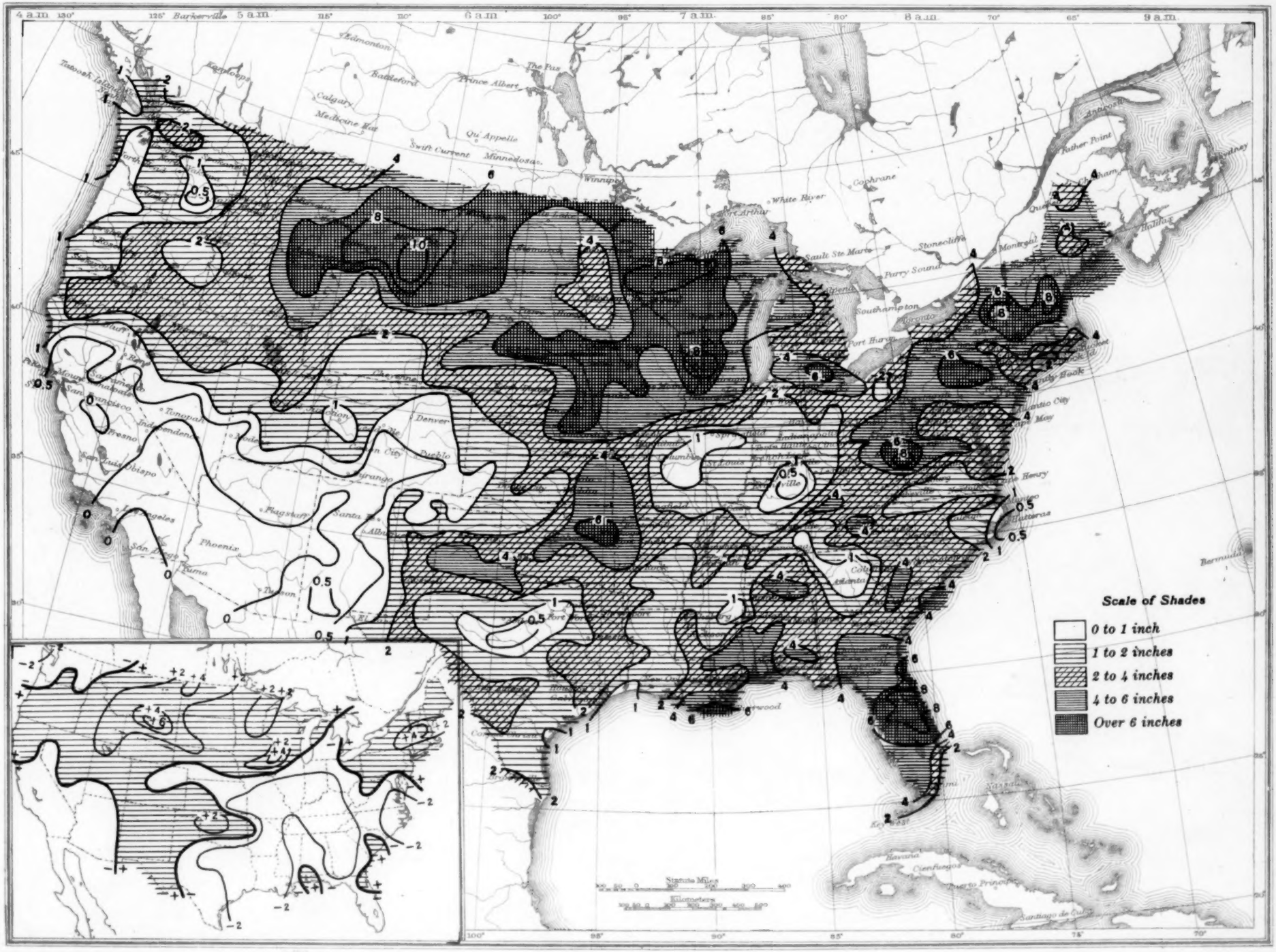


Chart VI. Isobars at Sea Level and Isotherms at Surface; Prevailing Winds, June 1944

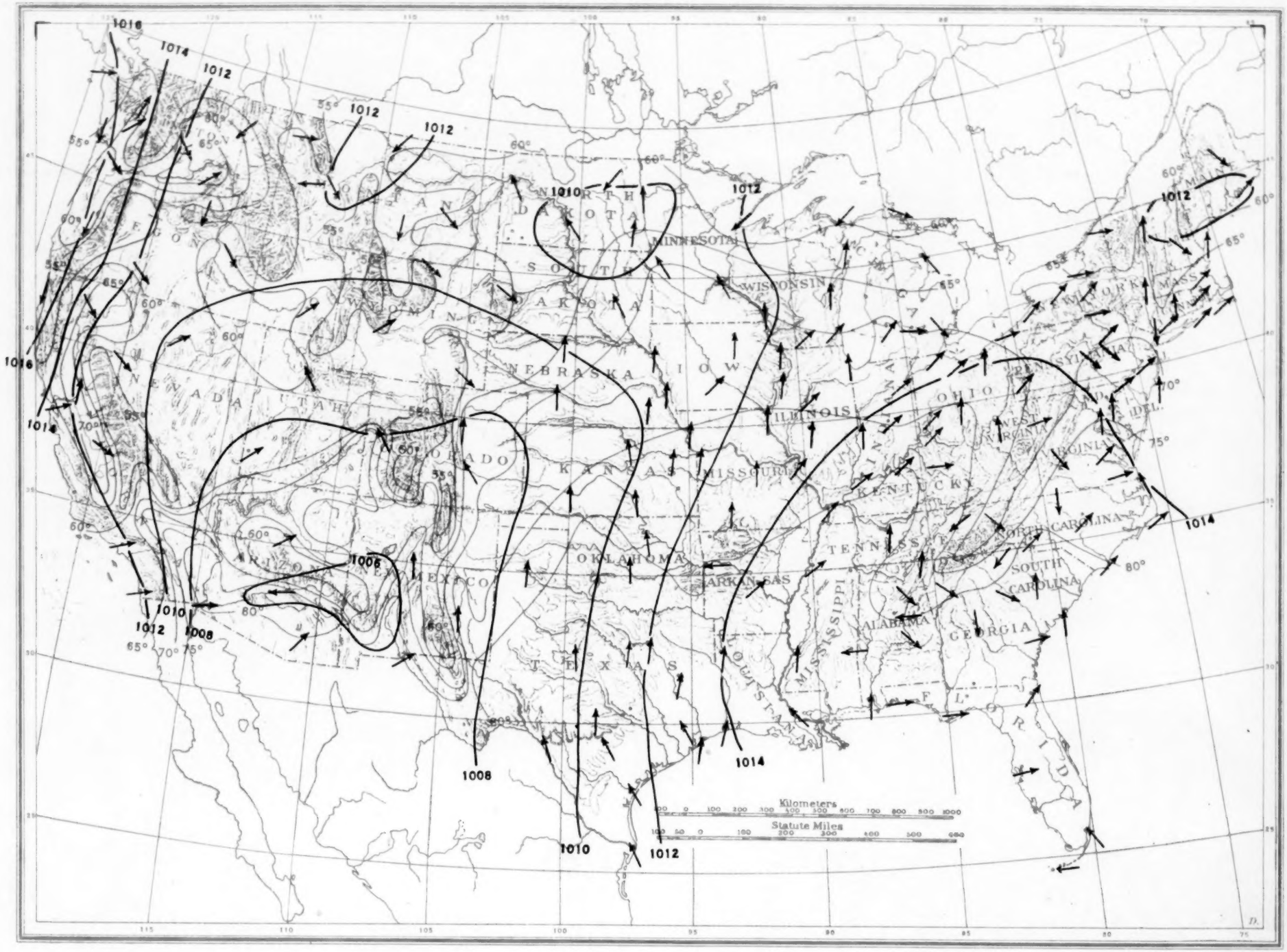


Chart VIII. Isobars (mb) for 1,524 Meters (5,000 ft.), and Isotherms (°C.), and Resultant Winds for 1,500 Meters (m. s. l.) June 1944

Chart VIII. Isobars (mb) for 1,524 Meters (5,000 ft.), and Isotherms (°C.), and Resultant Winds for 1,500 Meters (m. s. l.) June 1944

Isobars and Isotherms based on radiosonde observations at 11:00 p. m. (E. S. T.) and winds based on pilot-balloon observations at 5:00 a. m. (E. S. T.).

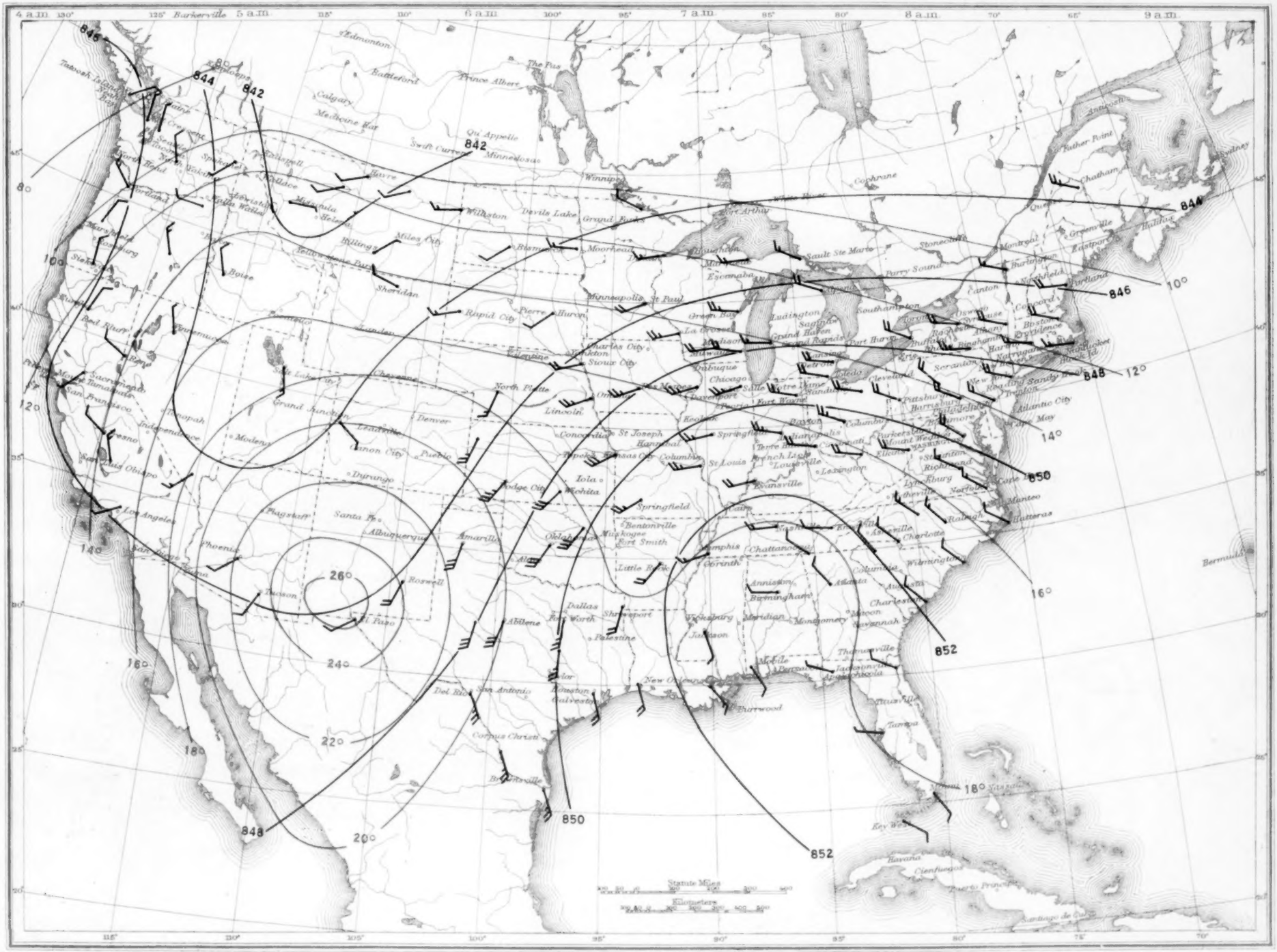


Chart IX. Isobars (mb), Isotherms (°C.), and Resultant Winds for 3,000 Meters (m. s. l.) June 1944

Isobars and Isotherms based on radiosonde observations at 11:00 p. m. (E. S. T.) and winds based on pilot-balloon observations at 5:00 a. m. (E. S. T.)

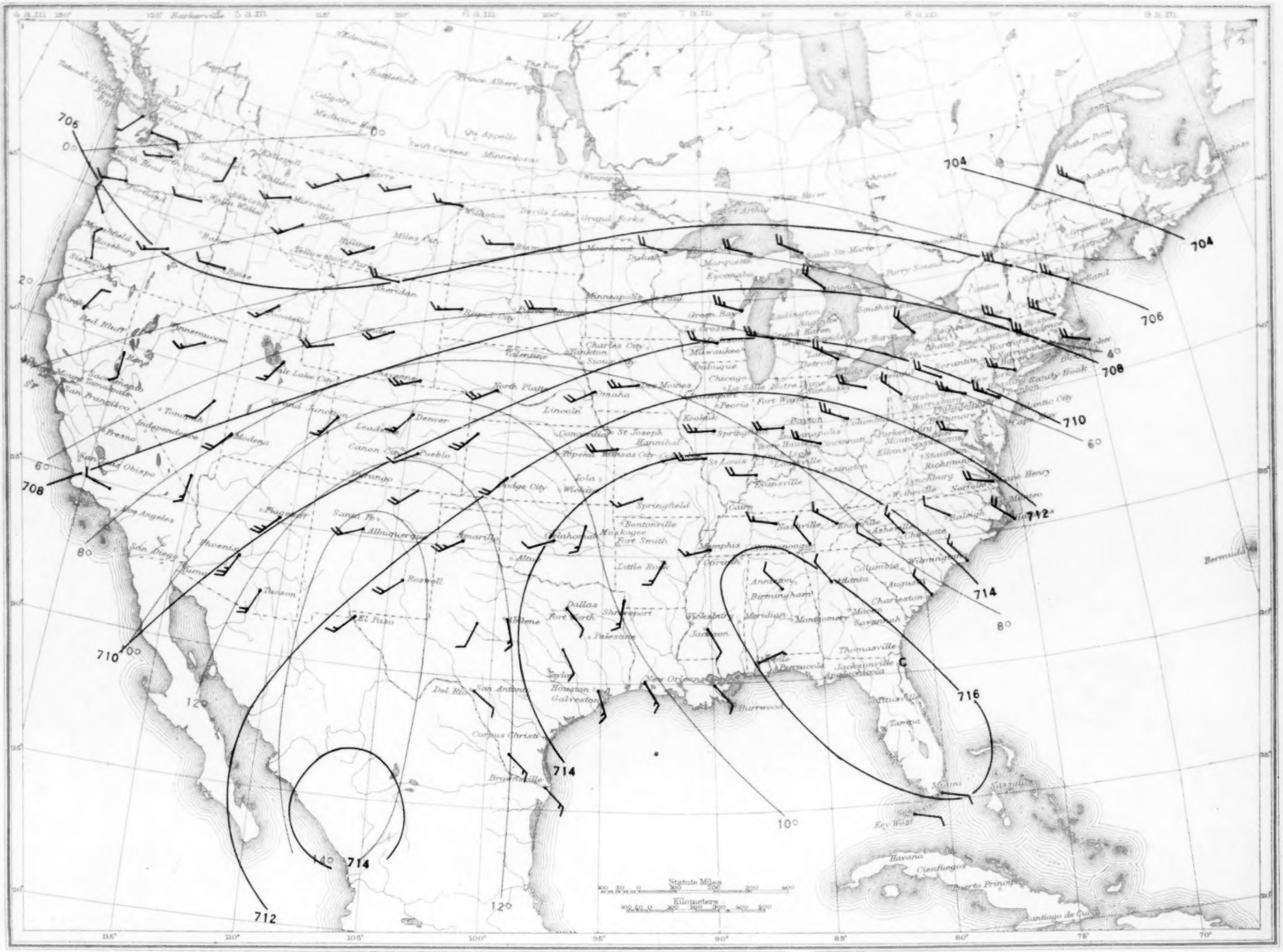


Chart X. Isobars (mb), Isotherms (°C.), and Resultant Winds for 5,000 Meters (m. s. l.) June 1944

Isobars and Isotherms based on radiosonde observations at 11:00 p. m. (E. S. T.) and winds based on pilot-balloon observations at 5:00 p. m. (E. S. T.)

Chart X. Isobars (mb), Isotherms (°C.), and Resultant Winds for 5,000 Meters (m. s. l.) June 1944

Isobars and Isotherms based on radiosonde observations at 11:00 p. m. (E. S. T.) and winds based on pilot-balloon observations at 5:00 p. m. (E. S. T.).

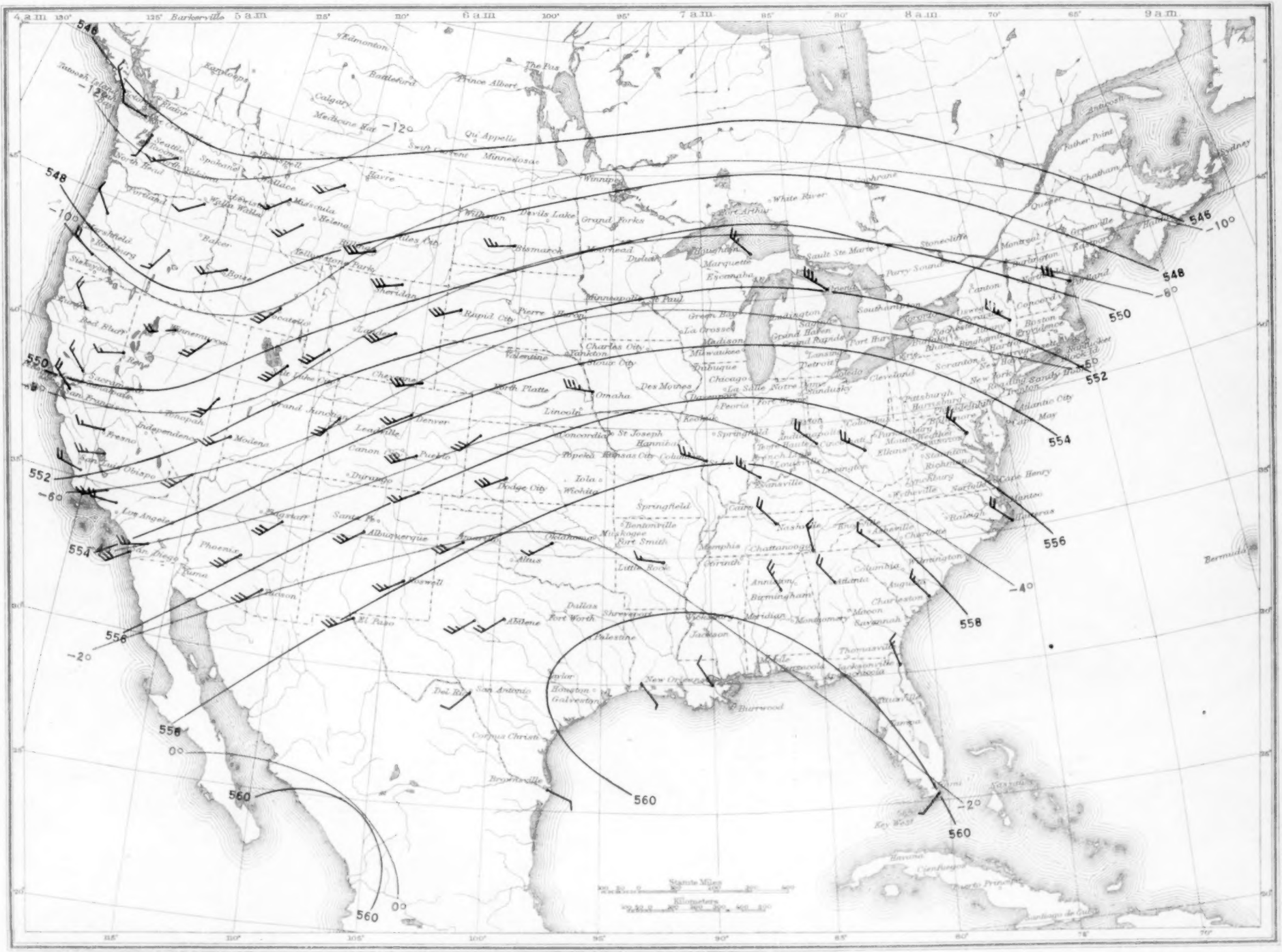
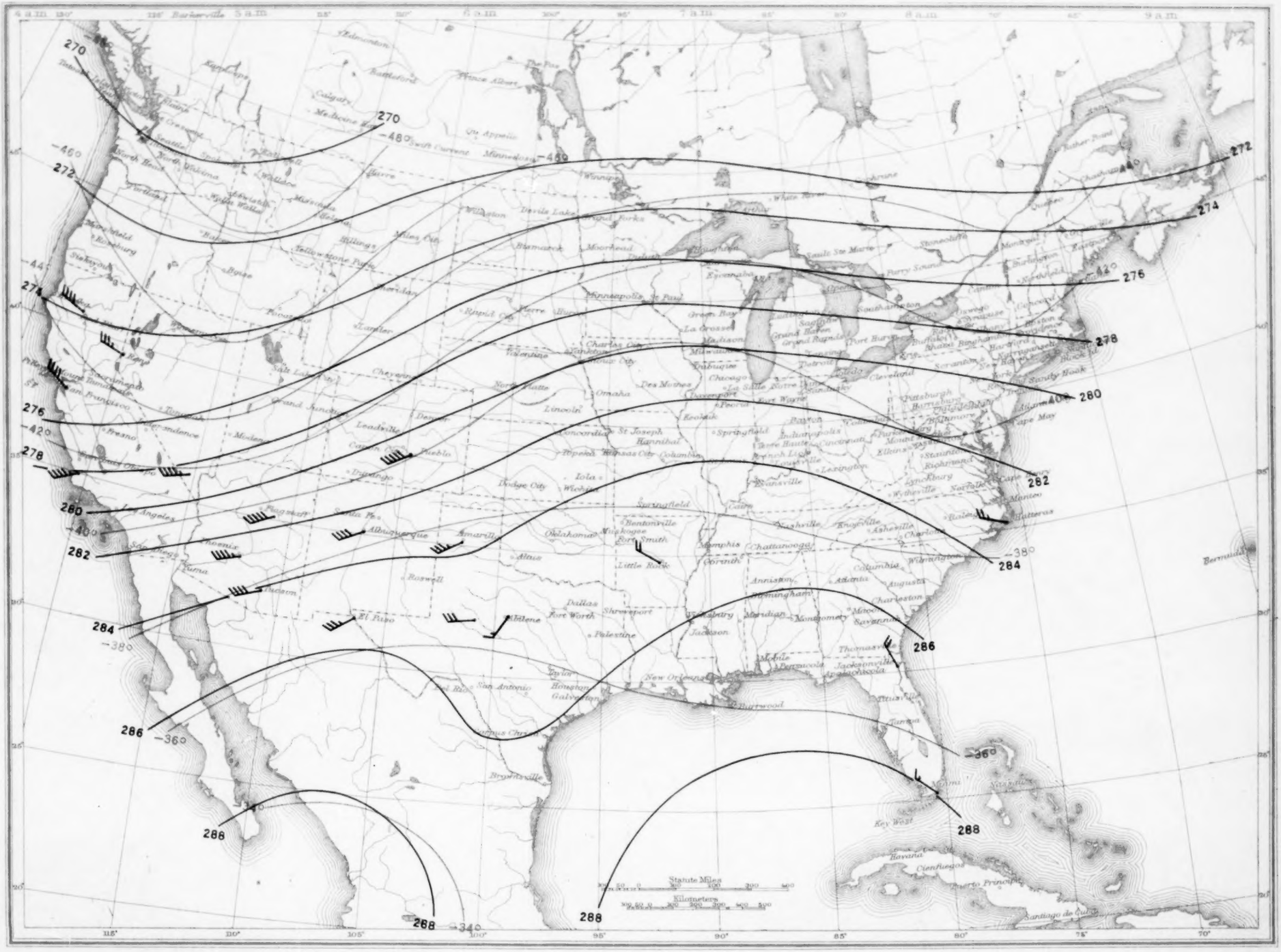


Chart XI. Isobars (mb), Isotherms (°C.), and Resultant Winds for 10,000 Meters (m. s. l.) June 1944

Isobars and Isotherms based on radiosonde observations at 11:00 p. m. (E. S. T.) and winds based on pilot-balloon observations at 5:00 p. m. (E. S. T.).